Gas Journal

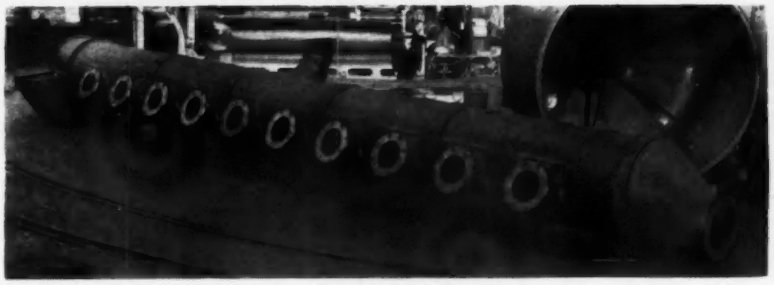
VOL. 294. 110th YEAR. LONDON, APRIL 9, 1958 No 4943 PRICE 1/6

HYDRAULIC RIVETING

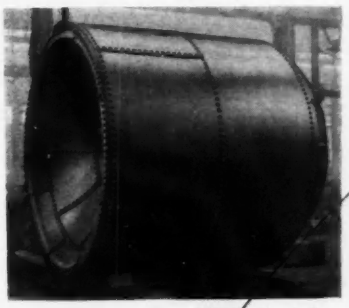
The 80 ton hydraulic riveting machine illustrated, is working on a gasholder column in the Plate Fabrication Shop. All classes of riveting are carried out at Dempsters to the most exacting specifications.

Makers of high quality by-product and chemical plant — condensers — detarrers — gas connections and valves—gasholders—iron castings—purifiers—stills — distillation columns and heat exchangers — tanks — washers—welded and riveted steelwork.

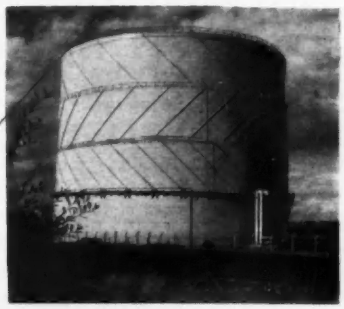
MANVERS MAIN. A Gasholder, of the type illustrated at right, of ¾ million cu. ft. capacity was installed by us on the Manvers Main Plant.



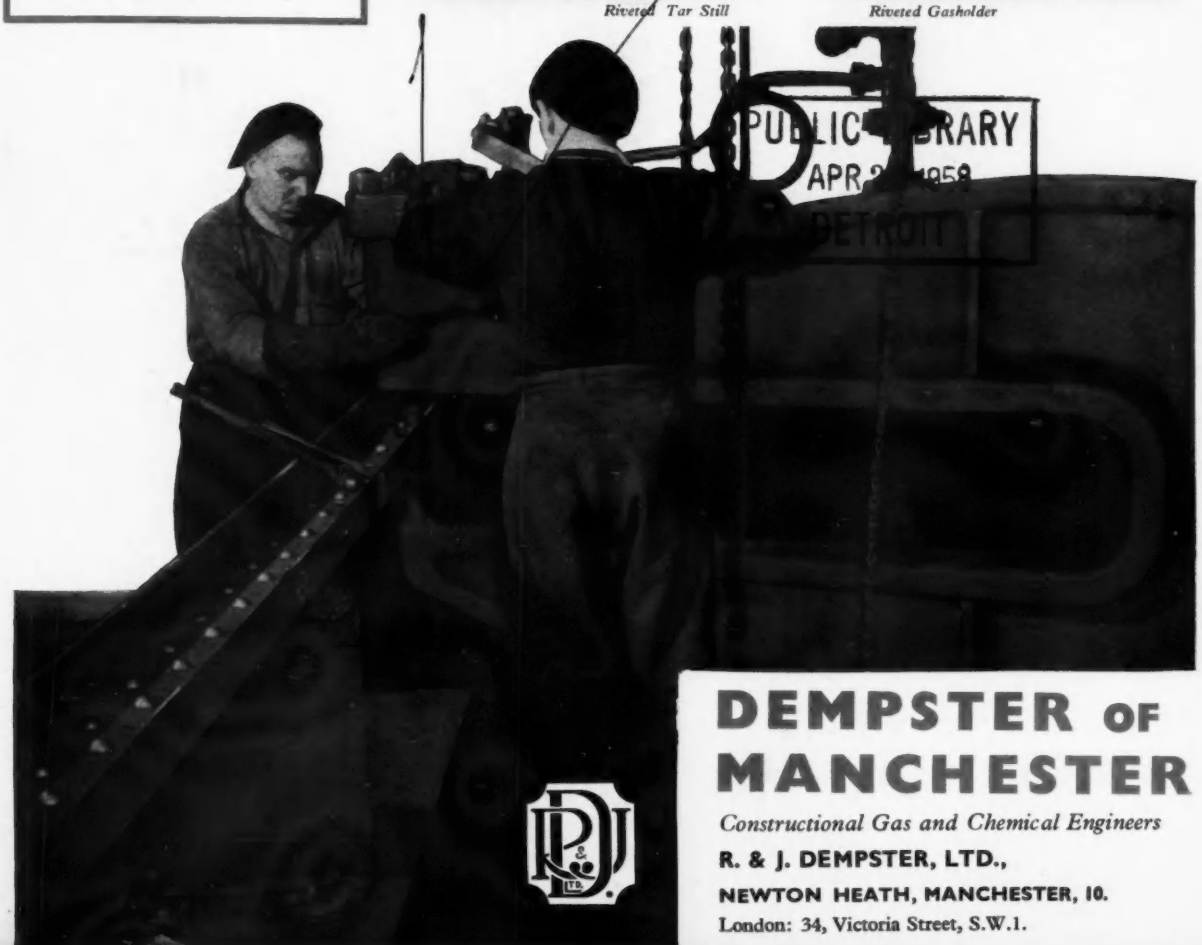
Riveted Process Vessel



Riveted Tar Still



Riveted Gasholder



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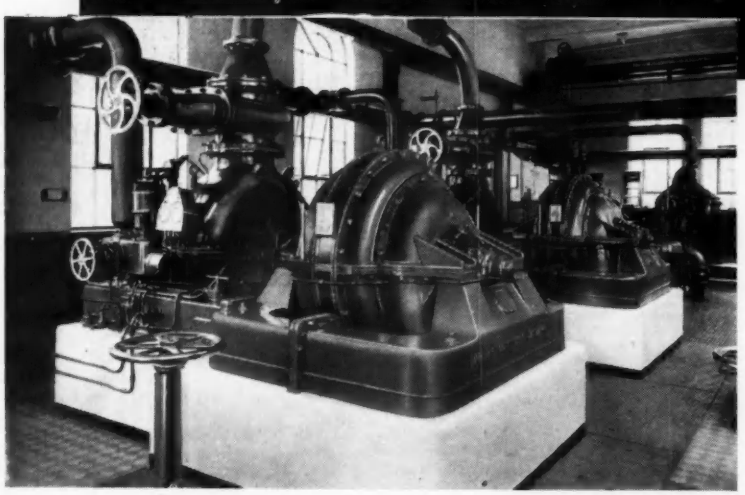

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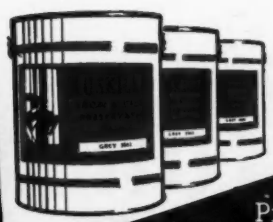

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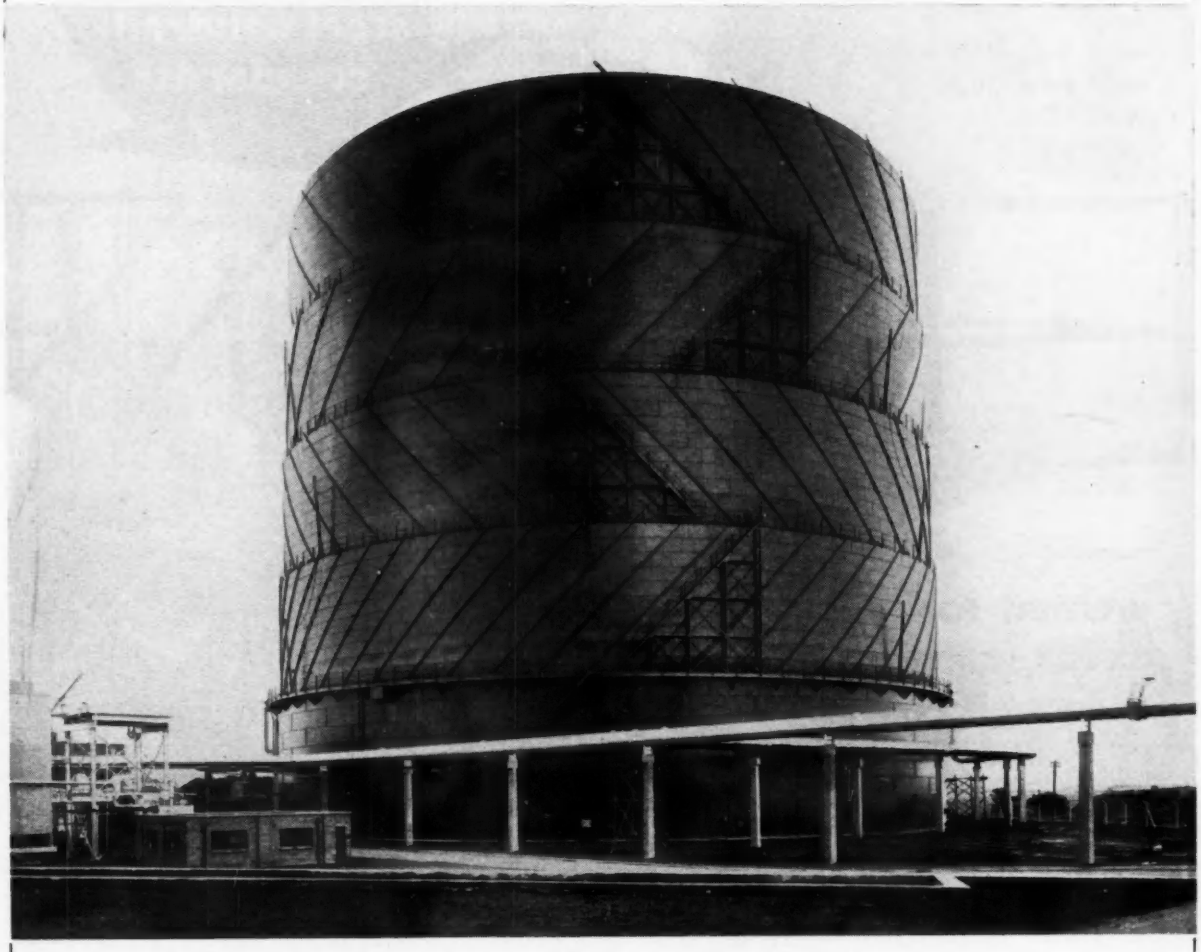

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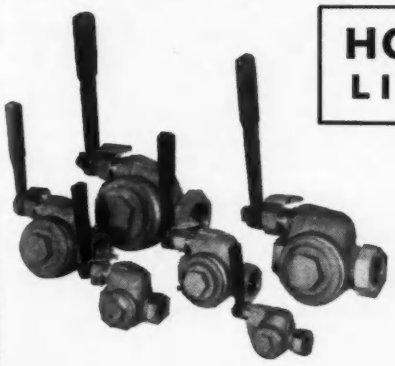

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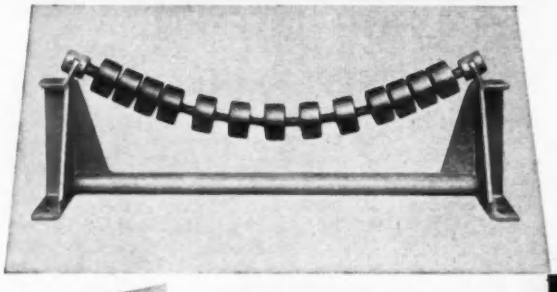

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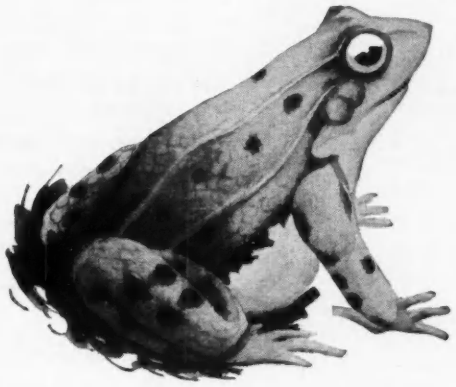
measured breathing.....



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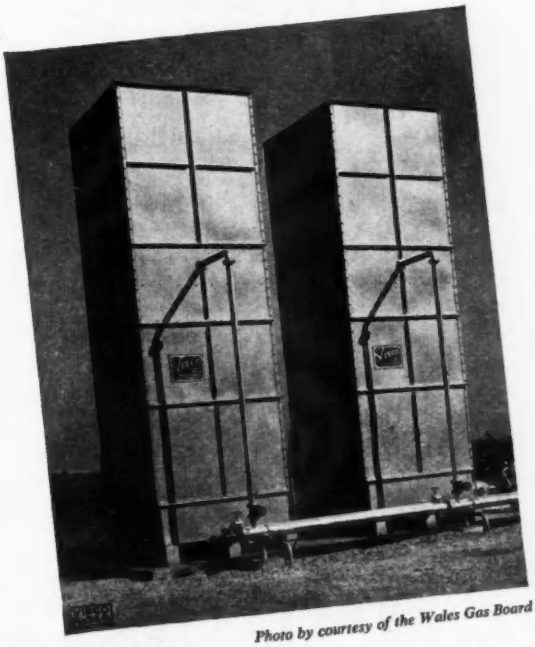

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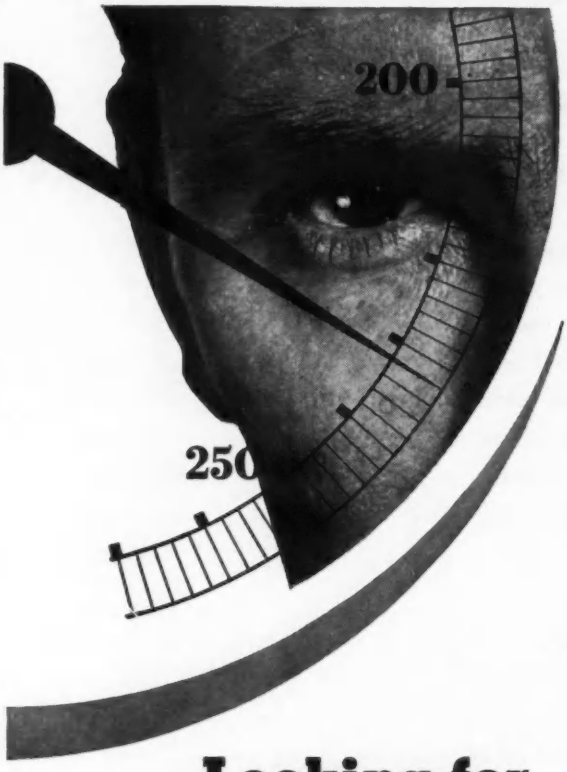

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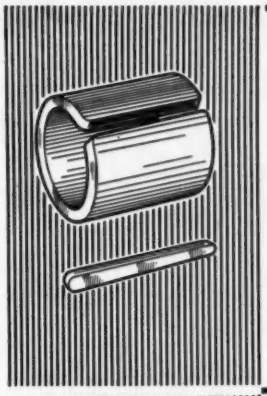

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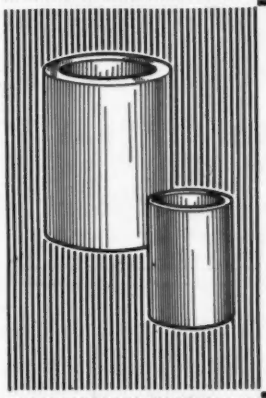

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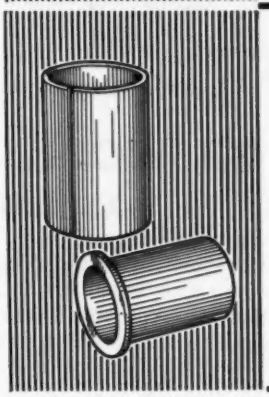

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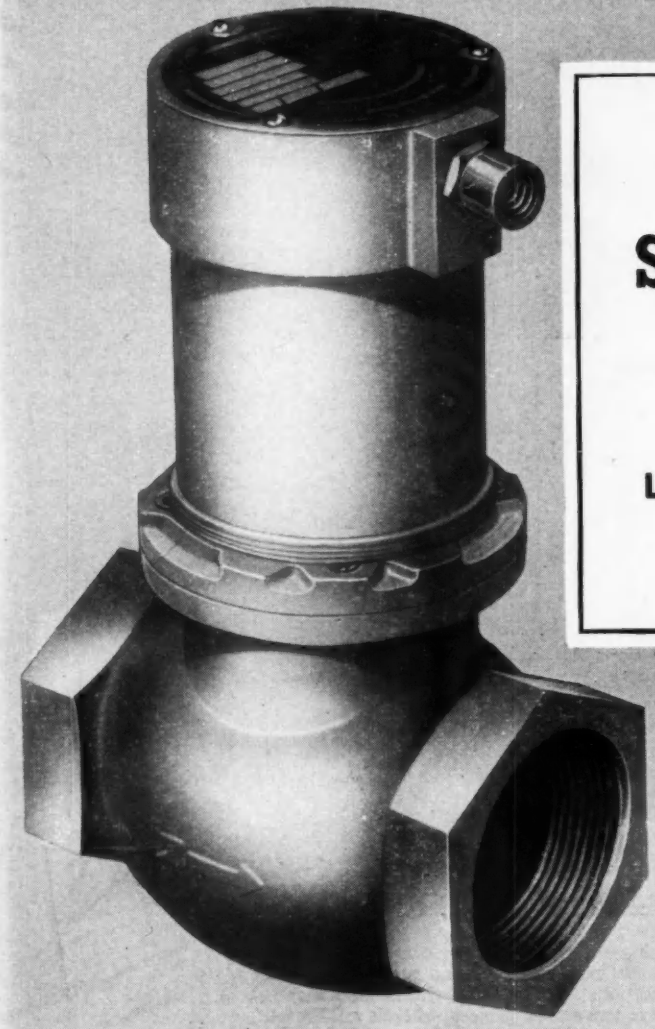

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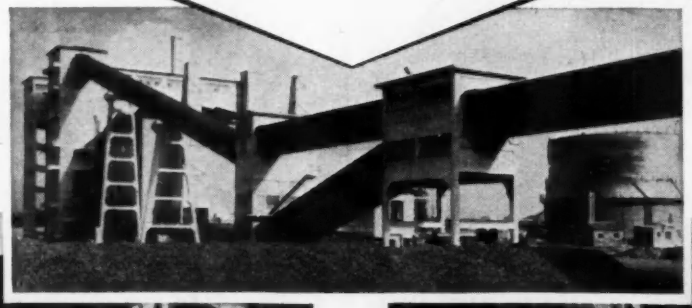

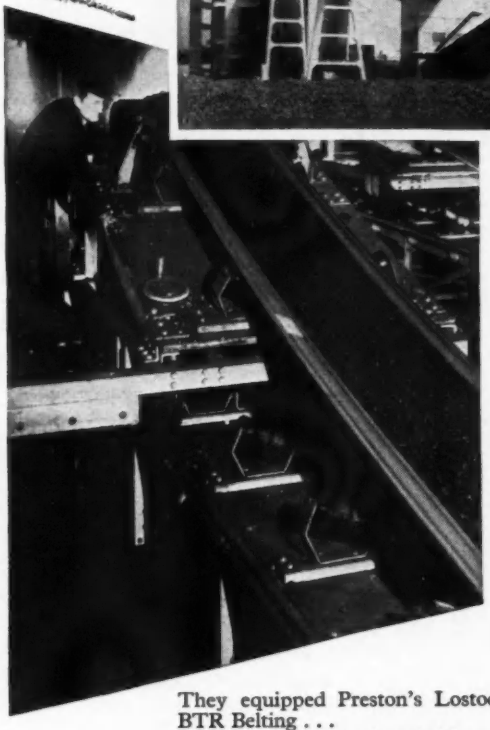

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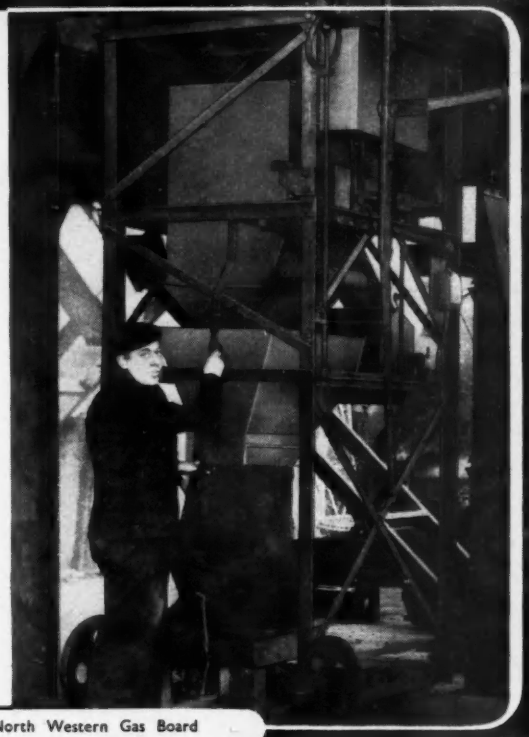

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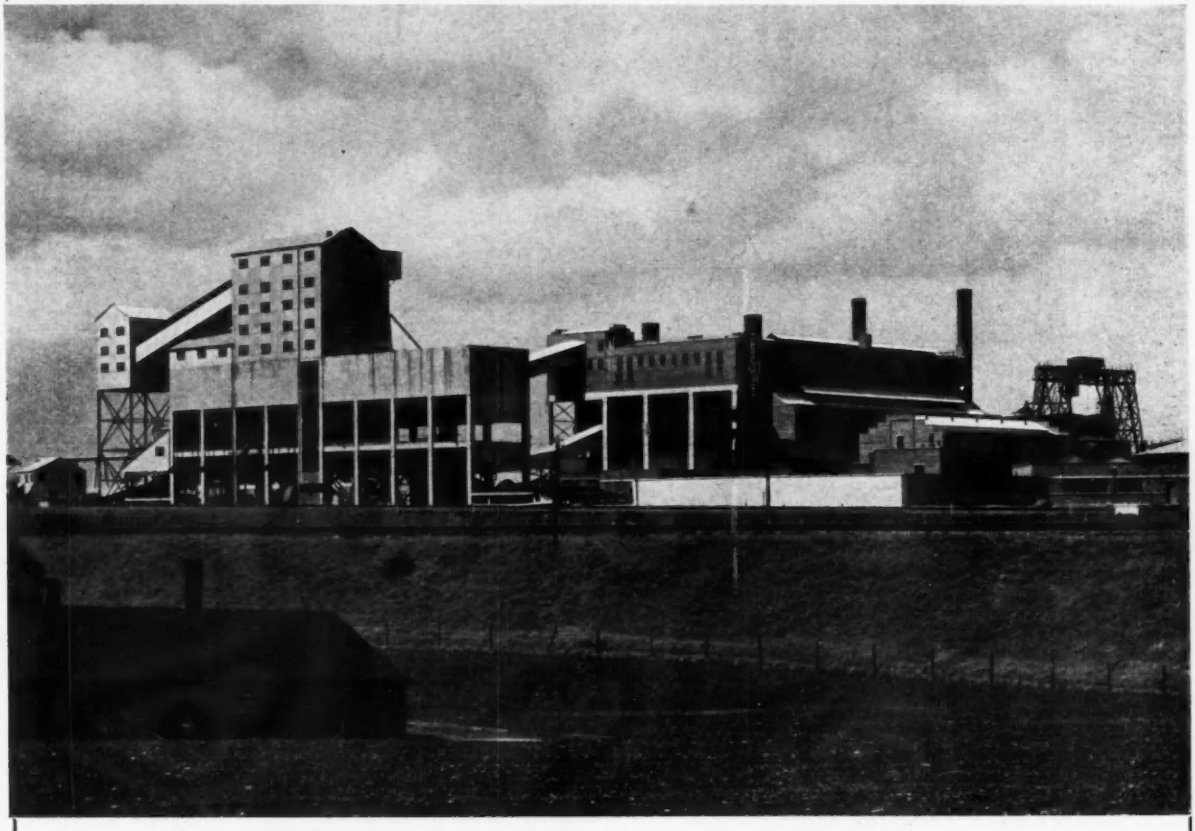

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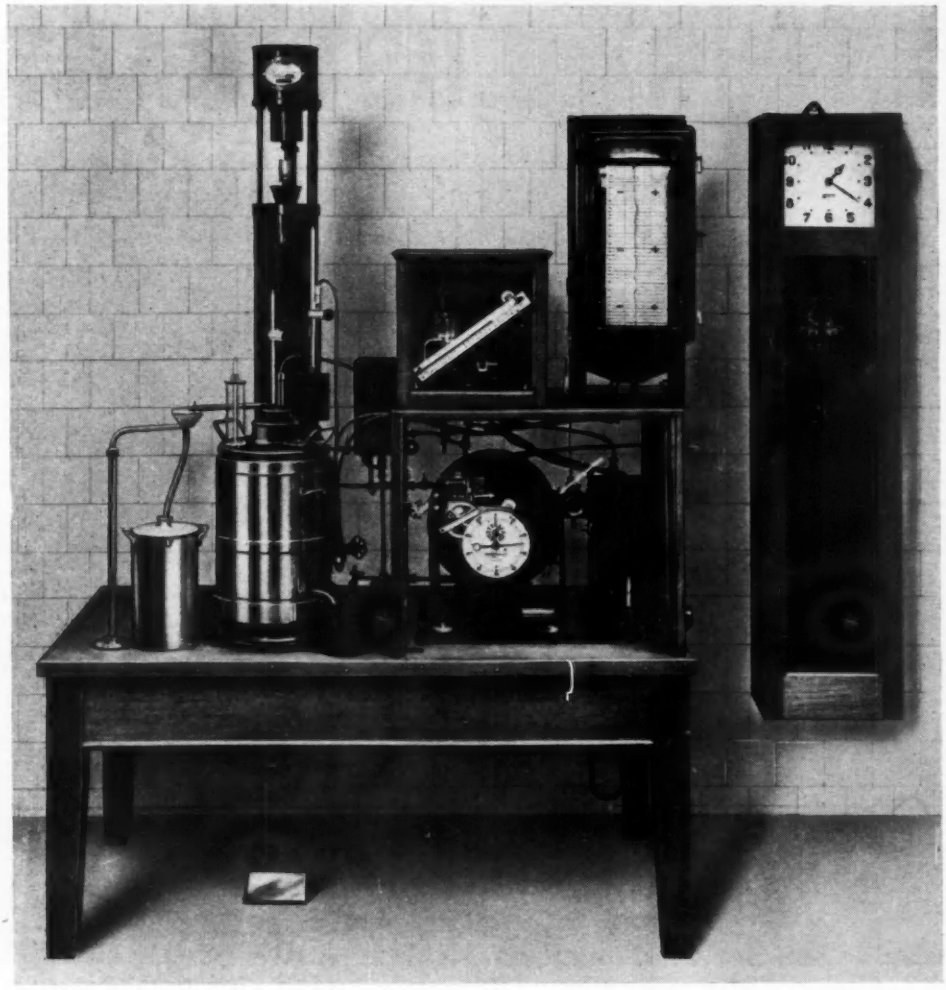

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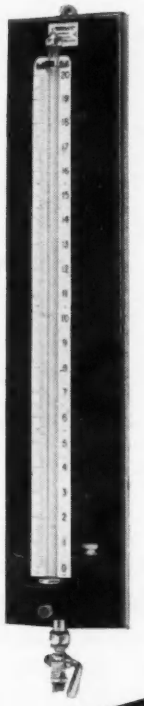

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Gas Journal

VOL. 294 NO. 4943 April 9, 1958

110TH YEAR

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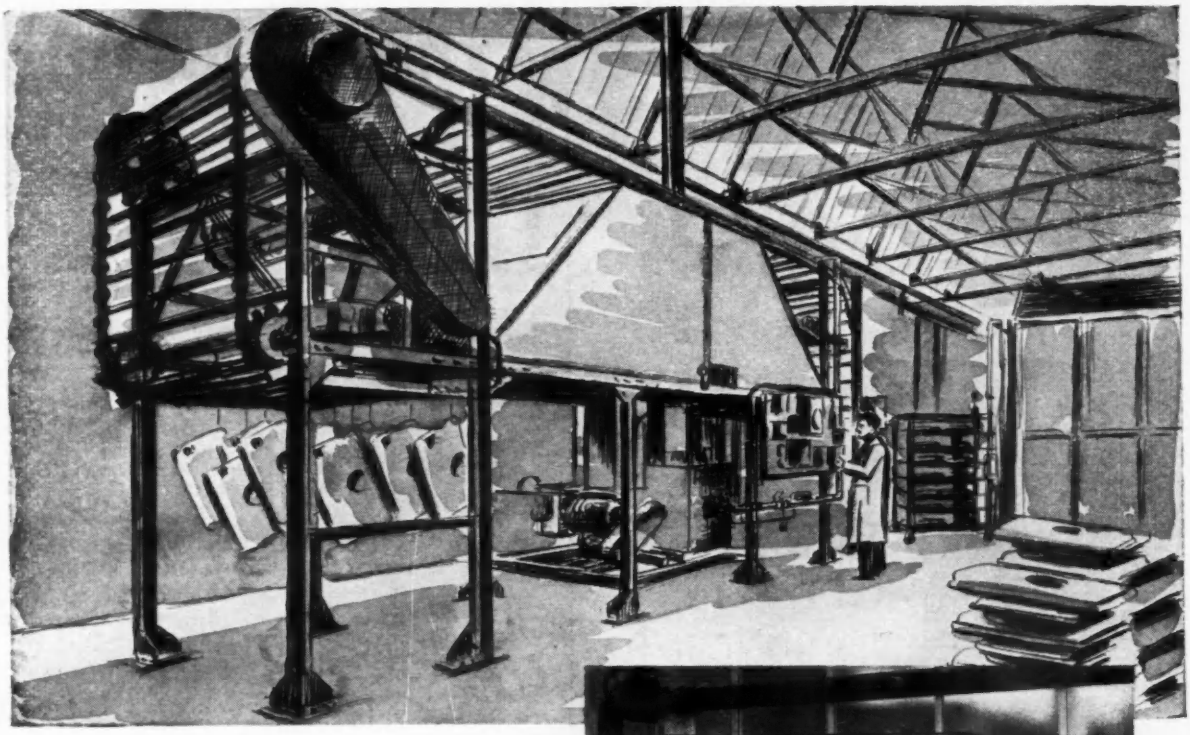

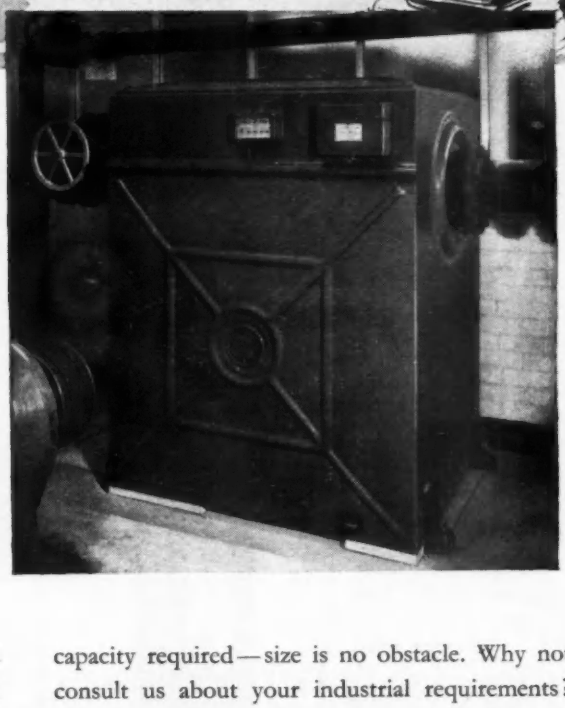

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Gas Journal

VOLUME 294. No. 4943. APRIL 9, 1958. 110th YEAR

Manvers Main Coking Plant

THE coking plant at Manvers Main colliery near Rotherham represents another step forward by the National Coal Board to integrate its coke-making activities with its main task of coal extraction. Most coking plants are to be found close to collieries, but as the need for special blends of coal increases, it may become necessary to site these plants within easy reach of several collieries, as was done at Avenue. At Manvers, however, it was found possible to extend an existing plant at a colliery and to modify the coal supply by building a central coal treatment plant on an adjacent site from which suitable coal could be transported by belt conveyor. The increasing importance to the gas industry of supplies of surplus gas from coke oven plants makes the commissioning of these large plants of considerable interest to the gas engineer.

Gas engineers will also be interested in the problems which the National Coal Board and the contractors had to overcome in extending an existing plant on a very confined site, in making provision for changing from metallurgical coke production to domestic coke production at short notice, and the keeping of these two products separate if they were being made simultaneously in different sections of the plant.

Since this is the largest coke oven plant owned by the N.C.B., the problems of mechanical handling, gas transmission and by-product recovery were more formidable than on any other of its coke-making plants. The site on which the coking plant at Manvers has been built is very restricted since it is cut up into irregularly shaped areas by railway lines belonging to British Railways.

Since these are main lines carrying much traffic it was impossible to divert them to make available extra space on which plant extensions could be built. It was therefore important that overall planning of a very high order should be resorted to before any action was taken to demolish old carbonising plant. The contracts for the supply of gas to the East Midlands Gas Board had to be met, which further complicated the contractors' task. To overcome this particular difficulty the old coke oven battery was reconstructed to form a group of five batteries of varying numbers of ovens, but all of the same dimensions. This was accomplished by first building, adjacent to the existing battery, a completely new battery of 21 ovens which would be large enough to maintain gas supplies, and demolishing the old ovens as necessary to make room for the other four batteries.

In addition to these five batteries, two larger batteries of ovens of greater capacity were built on a new site. The old ancillary plant was not big enough to deal with the increased make of gas, so a new and larger one was constructed to treat the whole of the gas from the ovens on the new site and about one-third of that from the old site. The routing of the crude gas mains to accomplish this was a difficult problem, since the two main sites are not near to each other.

To reduce the cost of transporting coal to this plant, it was decided to build a new coal washery at the colliery, to carry all the coal to the coke oven service bunkers by belt conveyor and to wind as much of the coal as possible at the Manvers Main colliery. This was made all the more necessary because of the need to blend at least three types of coal before they could be charged to the ovens. A major underground reconstruction scheme, therefore, had to be started at the same time as the development of the carbonising plant. Now, the coal from three collieries, including Manvers Main itself, is being wound at the one colliery and coal from a fourth brought overground to the new central washery. The throughput of coal carbonised by the coke oven plant is 3,000 tons a day of 0 to ½ in. blended coking slack which represents about 20% of the output of the washery. Each type of coking coal must be washed separately and the slacks blended independently of the coal washery to form a suitable mixture for the production of either a metallurgical coke or a domestic coke.

Such were the major problems that the N.C.B., with its main contractors, Simon-Carves, Ltd., had to face when it was proposed to extend the Manvers coking plant. This extension was not to add to the available coking capacity of the Board but only to replace that of six old smaller plants which were no longer economic. It was a big decision to make, but reducing coke production costs is so vital that the expense of this very large plant both in money and ingenuity was clearly

justified. It is most noticeable that the heavy cost was not in the coking plant itself, since this was quite conventional, though the dimensions of the coke ovens on the new site were large even by today's standards. The vital considerations are: The improvements to be obtained in coal handling both underground and on the surface, the mechanisation of all operations at the coking plant itself, and flexibility in coke handling so that the type of coke produced can be changed at any time should the steel industry be compelled to cut its outside demands for metallurgical coke.

Similar problems face the gas industry in its desire to close down worn-out gas-making plants, but the magnitude of the undertaking is not often on the scale that has to be faced by the coking industry. As a rule coking plants are very much bigger than the gas industry's, the coking industry is thus able to avail itself of the advantages of increased throughput and production to instal elaborate and costly equipment to solve many of the difficulties it faces. The siting of its plants at collieries, as near to its supplies of coal as possible, is something the gas industry has not been able to avail itself of yet, but the need for the expensive high grade coking coals, essential to the manufacture of metallurgical coke, cannot be avoided, whereas the gas industry may some day be able to avoid manufacturing gas from equally expensive gas coals. The coking industry has an outlet to the area boards for the great majority of its surplus gas, which tends to increase with coke ovens of higher efficiency while the gas industry goes through periods of coke surpluses which are often most embarrassing.

The future would seem to point to a very much closer tie-up between the coking departments of the N.C.B. and the gas distribution departments of area boards on the one hand and the collieries and the gas production departments on the other. If, as it is hoped, small coals of very inferior quality may be gasified by large capacity plants of comparatively low capital cost situated near the collieries, the gas industry would be able to take full advantage both of the great efforts being made by the coking industry to reduce its cost of production as reflected in cheap surplus gas, and at the same time of the easy handling from the coal treatment plants of an otherwise useless coal to high pressure complete gasification plants.

Wanted—a Policy

IN our correspondence columns this week we publish a letter from the national organisation representing the contractors who are responsible for the distribution of the major proportion of gas liquor to farms throughout the country. While many in our industry may never have heard of this body, those who have done so will be aware of the enormous contribution its constituent members have made to the progress of gas liquor as a nitrogenous fertiliser in recent years.

The contractors are concerned—and we think justly—at the absence of a unified policy in three principal directions—namely, standardisation of quality, continuity of supply, and efficient loading facilities. These are three vital factors in the maintenance of an efficient and economic service to the farmer; and while many gas boards co-operate to the full there are some who have not gone so far as they might in meeting an ever-growing demand, which now amounts to some 20 mill. gal. a year. There is no need to emphasise here that when a farmer buys traditional fertilisers in solid form, whether he farms in Kent or Cumberland, he gets a standard product at a standard price at any time he wants it. So he is not being unreasonable in expecting to get his liquid nitrogen on similar terms.

That our industry is coming—a little tardily perhaps—to an appreciation of gas liquor as an important by-product is borne out by Mr. T. A. Marriott in his recent paper to the Yorkshire Juniors which appeared in the 'GAS JOURNAL' on March 5. Two, at least, of his remarks are worth quoting in this context. We have here, he observes, not an effluent but a by-product which, properly exploited, can yield considerable financial gain and, at the same time, add to the nation's economy. A few sentences later Mr. Marriott makes an observation which, we think, will indicate to the National Association of Agricultural Contractors that there are not a few within our industry who see eye-to-eye with them in their plea.

We should be as jealous of the correct utilisation of gas liquor, he says, as we are of our other products, because its indiscriminate use will reflect upon us to the same degree. The time is now opportune, he goes on, for this method of disposal to be put on a firm footing with a clear directive from the highest level as to the conduct of its affairs and a recognition that this is the most profitable way of utilising crude ammoniacal liquor. Such a directive would ensure uniformity throughout the industry and enable results and practices to be collated and utilised to the common good. Need we say more to commend the N.A.A.C. appeal to those concerned?

We have urged that any negotiations on a nation-wide basis must take place with a representative organisation on the contractors' side. Here we have such a body coming forward ready and willing to negotiate on a national policy at top level.

Choosing a Career

ONE of the finest ways today for any boy to learn from the inside the sort of life he will lead and the opportunities that are available in industry or commerce is to attend what has become known as a short works course. With this object in mind, 31 boys drawn from public schools throughout the country will spend five days during their Easter holiday seeing the gas industry from the inside. They are to be welcomed in Derby on Sunday, April 13, by Mr. R. S. Johnson, Chairman of the East Midlands Gas Board. During the following days the boys will see gasworks, research laboratories, grid control centres, offices and showrooms in the Midlands, South West, and Wales. On the last day of the course, April 18, Dr. A. B. Badger, the Gas Council's Industrial Relations Officer, will preside over an end-of-tour 'any questions' session.

This is the second short works course arranged by the Gas Council in collaboration with gas boards and the Public Schools Appointments Bureau to stimulate interest among boys who are about to choose a career and to show them something of the wide variety of opportunities and careers which exist within the gas industry.

Personal

MR. W. J. STEED has been appointed Assistant Commercial Manager to the Southern Gas Board. Commencing his career with the Kenilworth Gas Company and Coventry Gas undertaking, after vesting day, he was appointed Divisional Sales and Service Manager (Warwickshire Division) West Midlands Gas Board and was subsequently appointed to his recent position as Divisional Sales and Service Manager (Sheffield and Rotherham Division) East Midlands Gas Board in 1950. For his paper 'Planning for better Sales and Service,' presented to the Yorkshire Junior Gas Association, he was awarded the S.B.G.I. Silver Medal. A full member of the I.S.M.A., he was a Founder Member and first Secretary of the Coventry Branch of the Association.

MR. KENNETH LEECH has been appointed Parkinson Cowan Area Representative in the North Western Gas Board. He succeeds the late MR. ERIC CULSHAW, who was the Company's Area Manager until his death in February of this year. Aged 28 years, he was educated at Knutsford College and Blackpool Technical College. In November, 1954, after war service, he became assistant to Mr. Eric Culshaw, the then Parkinson Cowan Area Manager of the North Western Gas Board. In September, 1955, he was appointed Assistant to MR. ERNEST HUGHES, Parkinson Cowan Area Manager for the East and West Midlands Gas Boards.

MR. C. W. SYMMONDS, Manager of the Dublin Branch and local Director of Falk, Stadelmann & Co., Ltd., has retired after 52 years with the Company. He is succeeded by MR. J. A. SLYE, until now Deputy Manager.

Society of British Gas Industries 1958 Awards

THE Council of the Society of British Gas Industries have again this year awarded silver medals to the junior gas associations for the best paper adjudged to have been presented during the year by their members at a general meeting.

A total of 27 papers were submitted by nine junior gas associations for adjudication. The awards were as follows:—

London and Southern Junior Gas Association, to F. H. Cope for his paper 'The Quantities Involved in the Rating and Performance of Oxide Purifiers'; Manchester District Junior Association of Gas Engineers, to N. Hare for his paper 'Alignment Charts and Graphical Aids for Use in the Control of Production Processes'; Midland Junior Gas Association, to J. R. Kilvert for his paper 'Operating Results at the New Swan Village Gasworks'; Northern Junior Gas Association, to H. Waiton for his paper 'Things Mechanical'; Wales and Monmouthshire Junior Gas Association, to A. Yates for his paper 'Notes on the Implementation of a Fuel Policy in Wales'; Western Junior Gas Association, to R. G. Lloyd for his paper 'The Utilisation of Coal within the Gas Industry'; Yorkshire Junior Gas Association, to P. C. Egan for his paper 'Dry Purification of Gas by the Gastechnik System.'

DUTY-FREE

THE Treasury have made the Import Duties (Exemptions) (No. 4) Order, 1958, which exempts methane from duty under the Import Duties Act, 1932.

The Order came into operation on April 2, and has been published as Statutory Instruments, 1958, No. 537.

Gas Council Drama Group's Production

ANOTHER substantial performance was given by the Gas Council's Drama Society recently when they tackled Emlyn William's play 'Someone Waiting.'

Andrew and Denis Scott-Wilson bore the main burden of this thriller, while Frank Edwards and Ivy Miller took the other main parts.

Other players were Peggy Clarke, Mary Dugan, Winifred Fraser, Bill Quinlan, and Kathleen Roberts. Producer was Tommy Cook.

Solihull Inauguration

'GAS INDUSTRY HAS BEEN REBORN'

THE Midlands Research Station at Solihull was inaugurated by Sir Cyril Hinchelwood, President of the Royal Society, on April 1. At the luncheon at the Town Hall which followed, the Mayor of Solihull, Councillor W. E. Wright, referred to the progress which would result from gas industry research, and compared it to the other great project being developed in Solihull by the Rover Co., Ltd., the jet motor car.

Sir Harold Smith, Chairman of the Gas Council, welcoming the guests, spoke of the great changes in the industry which were being brought about by current work at the Midlands Research Station.

Sir Cyril, replying on behalf of the guests, said: 'The new gas industry has been born today.' Its birth was largely the result of the work of Dr. F. J. Dent and his colleagues, continued Sir Cyril.

Research had two main duties—to find ways and means of providing known needs and, with the help of close scientific observation, to foster a general awareness of natural trends.

For the gas industry, the fulfilment of the first duty was to find means of producing cheaper gas from lower grade coal, but the latter was something of a gamble. The greater the scale of the gamble, the greater the chances of success.

Research carried out on a big enough scale must always succeed and the projects now under investigation could not fail. In the last resort, however, people were more important than anything else.

Diary of Forthcoming Events

April 10.—INSTITUTE OF FUEL: Institution of Civil Engineers, Great George Street, London, S.W.1. Joint Meeting with British Section of the Société des Ingénieurs Civiles de France, with Paper on 'Lacq: Its Problems and Potentialities.' 5.30 p.m.

April 10.—COMBUSTION ENGINEERING ASSOCIATION (SOUTHERN REGION): St. Ermin's Hotel, London, S.W.1. Papers include 'The Measurement of Oxygen in Flue Gases,' by F. T. Ashmore, of I.C.I. Ltd. 10 a.m.

April 11.—INSTITUTE OF FUEL (SOUTH WALES SECTION): Cardiff. 'Planning and Maintenance of an Oil Refinery,' by W. G. Elgie. 6 p.m.

April 14.—INSTITUTE OF FUEL (NORTH EASTERN SECTION): King's College, Newcastle-on-Tyne. Annual General Meeting. 6.30 p.m.

April 15.—LONDON AND SOUTHERN SECTION, I.G.E.: Pepys House, 14, Rochester Row, London, S.W.1. 'The Production of Domestic Solid Smokeless Fuels,' by Dr. A. C. Monkhouse, PH.D. 2.40 p.m.

April 15-17.—INSTITUTE OF FUEL: Residential Conference at Sheffield on 'Science in the Use of Coal.'

April 16.—YORKSHIRE JUNIORS: Visit to the works of J. H. Robinson & Co. (Liverpool) Ltd.

April 17.—INSTITUTE OF FUEL (EAST MIDLAND SECTION): Gas Showrooms, Nottingham. Annual General Meeting, followed by film. 6.15 p.m.

April 17.—MIDLAND JUNIORS: President's Day, including visit to Reading gasworks and luncheon at Great Western Hotel, Reading.

April 19.—WESTERN JUNIORS: Radiant House, Bristol. Annual General Meeting. 2,30 p.m.

Price of Gas is Slashed for 50,000

Northern Board Unifies Tariff at Cost of £80,000 a Year

THE Northern Gas Board is to introduce a unified tariff for its 709,000 consumers at a cost of £80,000 a year, it was announced at a recent meeting of the Northern Gas Consultative Council. The reduction, which will benefit nearly 50,000 consumers, is the first to be put into effect by the Board since nationalisation and is the result of integration.

From May 1 consumers will pay 23½d. for each of the first 30 therms, irrespective of where they live. At present the Board's area is divided into three pricing zones. The first consists mainly of industrial and urban districts on the east and west coasts and has the lowest price of 23½d. The third zone covers mainly rural and semi-rural districts and has the highest price of 29½d. while an intermediate zone between the two has a rate of 26½d. Prices will now be unified with the lowest, with the same tariff structure—23½d. for the first 30 therms, thereafter 15.66d. per therm, with further reductions on a graduated scale.

Announcing the unified tariff, Alderman Joseph Hoy, Chairman of the Consultative Council, said the Board was the first in the country to decide on a substantial reduction in prices. Progress in manufacturing methods and new link-ups in supplies had made this possible.

'If we get some measure of stability within the industry I am hoping that the next move by the Board will be a reduction in gas prices generally. This can only be made if there is price stability, sound organisation, and public confidence in the industry.

'If we get these I am quite certain there is a very rosy future for the gas industry. This is a very big and welcome step in the right direction and one to which Mr. E. Crowther (Chairman of the Board) has looked forward for a very long time.'

Mr. J. E. White, Deputy Chairman of the Board, said 44,600 consumers would find their bills reduced by 3d. per therm, which meant that there would be an annual saving for the average consumer of between £1 and £1 10s. Another 4,750 would get a reduction of 6d. per therm, equal to an average annual saving for the consumer of between £2 and £3.

CORRESPONDENCE

Closer Links Needed for Liquor Production and Distribution

DEAR SIR,

Some weeks ago there appeared in the *Farmer & Stock-Breeder* an article entitled 'Know-How of Gas Liquor,' based on information supplied by the Gas Council. This account indicated that gas boards are supplying this fertiliser to farmers at the rate of more than 20 mill. gal. a year; but it did not indicate the means whereby the great proportion of liquor reaches the land—that is, through the services of operators who are members of the National Association of Agricultural Contractors.

There may be many in the gas industry who are unaware of the existence of this body and of what its members have done and are doing towards the development of the gas liquor market. Since, in your issue of November 13, you expressed the view that 'negotiations on national policy must be with a representative body to which all liquor contractors should belong,' we feel it appropriate that this Association should now make a direct approach to the gas industry through your columns with the object of paving the way to closer liaison between those concerned with production and those concerned with distribution.

We, the contractors' organisation, readily acknowledge the pioneer work of certain individual members of the gas industry, as a result of which we were able to go out and sell the idea to farmers with every confidence. Over the past five years members of the National Association of Agricultural Contractors have applied many millions of gallons of ammoniacal liquor to farm land, and have succeeded in breaking down a great deal of the prejudice inherent in a new commodity. Indeed, farmers in many areas have now come to accept ammoniacal liquor as a normal form of nitrogenous fertiliser, which can be applied by contractors on an economic basis.

While our members have established excellent working relations with many of the area boards, this has not been so in every case, and we are conscious of the apparent absence of a co-ordinated policy throughout the industry. There is still a degree of uncertainty in some areas, and uncertainty which members feel should not exist after five years of progressive work.

We are therefore most anxious to secure the co-operation of the gas industry in (a) standardisation of quality at 10 oz. strength—members from certain areas report that it is still not possible to obtain a reliable supply of clean 10 oz. liquor. (b) Securing adequate supplies during the application season. (c) Good loading facilities eliminating spillage and delay—a quick turn round at both ends of the contractors' job is essential.

The demand for ammoniacal liquor is established. It is a product for which agriculture is asking on an ever-increasing scale—a scale indeed which we think might surprise many in the gas industry. As a result of five years' experience of the distribution and application of ammoniacal liquor we are able to give the farmer the service he demands and upon which he now depends in many counties.

In order to ensure smooth and efficient working in the future, however, we suggest that a co-ordinated policy which has operated so well in some areas be extended throughout industry, and we appeal for the closest co-operation between all parties concerned in this valuable contribution to the nation's food production.

Yours faithfully,
W. F. P. BISHOP,
Secretary.

National Association of Agricultural Contractors,
52, Bedford Row, W.C.1.

Lament for Vauxhall

DEAR SIR,

For sentimental reasons I regret the passing of the historical Vauxhall gasworks which were so closely associated with the famous names of Woodall and Carpenter.

When in the U.S.A. in 1906, the late Dr. Carpenter asked me what job I wanted when I returned home, and as the late Assistant Engineer at Vauxhall had recently died, I asked for the job and got it.

Vauxhall was the 'pet works.' Its carbonising results topped the weekly comparison lists. It was claimed that more gas per acre of ground space was made there than in any other works in the country.

Being 'packed tight,' Vauxhall was kept scrupulously tidy and it was with great pride that I was permitted to help with maintaining the high efficiency and output of over 12 mill. cu.ft. of gas per day.

Vauxhall was a 'happy ship' with a fine record!

Yours faithfully,
W. G. HEAD.

11, Arterberry Road,
Wimbledon, S.W.20.

Radiation Ltd. Chief on Encouraging Reception of Latest Products

IN his statement accompanying the accounts of Radiation Ltd., for the year to December 31, 1957, the Chairman, Mr. W. Donald King, paid tribute to Dr. Harold Hartley, C.B.E., who, in consequence of having attained the age of 70, did not seek re-election to the Board of Directors at the Annual General Meeting.

'Dr. Hartley has made an outstanding contribution in the technical field, not only to our Company but also to the fuel industries it is our privilege to serve,' said the Chairman.

'On the formation of Radiation, Ltd., in 1919 he was placed in charge of the newly formed Radiation Research and Development Laboratories, and was thus from the outset associated with, and indeed largely responsible for, the wide range of highly successful appliances upon which the world wide reputation of Radiation has been built and which has made New World equipment a household name.

'In 1939 he was appointed a Director of Radiation, Ltd., still in charge of the Research and Development Laboratories, of which he was an inspired leader. In 1944 he was appointed a Managing Director of Radiation, Ltd. Following his appointment as Deputy Chairman in March, 1948, he was Chairman of the Company from December, 1948, to December, 1955, a period of considerable prosperity for the Company.

'In making this tribute on behalf of my colleagues and myself, in appreciation of his valued services to the Company, I am sure that I can also speak not only for all the members of the Company but also for the wide circle of friends within the fuel industries in which Dr. Hartley has played such a distinguished part, when we wish him very well in his retirement.

Accounts and Dividends

'The annual report and accounts show that the net profit after tax for the year was £48,266 compared with £233,573 for 1956.

'The results for the year were affected by continued trading restrictions which were further increased in September. The intensified development instituted to meet these conditions involved heavy preproduction costs. The new products were not in full production at the close of the year so that the accounts reflect the full cost but not the full result in income.

'In view of the encouraging reception of these latest products, as evidenced by a level of sales showing an increase of 16% compared with the same period last year the Board recommend the payment of an Ordinary dividend of 5% by augmentation from the general reserve of Radiation, Ltd., which was set up in earlier years to meet such an exceptional contingency.

'The investments in British Government Stocks appear in the balance sheet at £2,105,163. The market value at December 31, 1957 was £1,662,520. The difference of £442,643 is partly offset by the investment reserve of £238,766. Your Board does not consider it necessary to make a specific reserve for the balance of £203,877, as the securities are almost entirely in dated stocks which are repayable at par, which is some 5% greater than the book value.

'The loans to municipal authorities are all repayable at par at varying periods up to 1962. The trade investment is the cost of the investment in the Australian Company in which your Company has a half interest.

'It would not, of course, be enough to improve the products. We have no illusions about the probable course of industrial activity in 1958; it is going to be a stern struggle.

'At the end of the year it was decided to bring together the export sales departments of the various Group Companies. Radiation Group Export Sales, Ltd., was formed to concentrate on the development of export sales of all Group products in all our markets overseas.

Organisation

'We cannot control adverse external forces, but we can adjust our operations to them. The policy of your Board is to preserve the growth prospects. The controlled, though heavy, development investment; our general reorganisation to secure concentrated attention to the differing requirements of our major interests and increased attack on exports, are means to this end. There are signs that the rate of increase of costs is slowing up. The chief factor in profitability in the immediate future is a reasonable level of volumes.

'As a Group interested in providing domestic appliances for all fuels, we have streamlined our organisation into fuel divisions of which the chief are:—

'1. **Gas.**—Our main interests in this division are the cooking, space and water heating appliances which are very well known. It is not so often appreciated that we have a leading position in the supply of heavy duty equipment for the hotel and catering trade. Another activity is a section producing equipment for the industrial use of gas. Allied to this division is the subsidiary Company—Bratt Colbran, Ltd.—an outstanding name in domestic and industrial gas space heating, and perhaps even better known as the foremost designers and suppliers of beautiful fireplaces. It is no exaggeration to say that Bratt Colbran, Ltd., provide a unique service, and we are proud of the esteem in which the name is held wherever high æsthetic standards of design and workmanship are appreciated.

'Another ally, linked also to solid fuel and oil, is the section dealing with warm air appliances. Radiation, Ltd., pioneered the introduction in this country of ducted warm air as a controlled means of domestic heating. This method is now more readily accepted not only for houses but for schools, halls and similar buildings, because of the high standard of comfort it affords. Recently, Radiation, Ltd., have entered into an agreement entitling them to manufacture for the home market and certain overseas territories the wide range of warm air appliances devised by the well-known Eureka Williams Corporation of America. The agreement also provides for the mutual exchange of technical information about design and production methods. The link between the two Companies will further enhance the high standard of development that has been achieved in the past ten years.

Most Recent Addition

'The most recent addition to the Radiation Ductair series is the Ductair 20 which, when used with a Radiation gas, solid fuel or oil-fired water heater, will provide economical space and water-heating for the average small house or flat.

'Yet another related unit is Geo. Glover & Co., Ltd., making gas meters. This year sees the launching of a new type of meter.

'2. **Solid Fuel.**—In a smoke conscious age our aim has been to produce appliances suited not only to burn smokeless fuel but which can also truly be described as smoke-reducing when burning bituminous coal. It is a curious fact that it has been, and still is, hard work to promote interest in these developments. The Parkray series of solid fuel smoke-reducing fires is becoming known. More recent developments are the Yorkmaster thermostatically controlled cooker designed to burn all types of solid fuel with a minimum of smoke, and the Heatmaster designed on the same principle, which provides from one appliance a comprehensive service of cooking, water heating and space heating by ducted warm air.

'Included in the solid fuel division is our range of baths, the latest attractive designs of which are the Cygnet and the Taplow.

'3. **Electricity.**—Our Luton factory is now wholly devoted to the development and production of electrical appliances. The comprehensive range of Jackson electric cookers is well known. During the year the latest models were being supplied with the new Jackson-Ego Speedring hotplate units, which give a remarkably improved performance. These have been developed under working arrangements for the exchange of technical information entered into with a leading Continental company. These new models are available for both home and

export markets. Other main products of this division are wash boilers, space and water heaters, and additionally a full range of heavy duty equipment for hotels and similar establishments.

'4. **Oil.**—This newest branch of our activities has been referred to previously in connection with our warm air appliances, all of which are available with oil units.

Export

'In spite of continued difficulties in some of our markets and increasing competition in others, we have maintained the peak sales figures referred to last year. In spite of added new restrictions on imports in New Zealand which have been imposed this year, it is gratifying that the sales reported by our new Export Company, in the first two months of their existence, show an increase over the corresponding period in 1957. Included in the activities of the new Export Company this year will be an active survey of the potential European Common Market.

'Steady progress is being maintained in the building up of this new undertaking, despite the difficult trading conditions in Australia. Bottled gas, now being made available, will add a new outlet for their activities. Development of new gas fires and gas cookers for local manufacture is actively proceeding. A small profit was made on the year's operations.

'Trading conditions have been as trying for our subsidiary in New Zealand. The situation has not yet improved. A series of new electric and gas appliances will be marketed during the coming months, which in conjunction with the present restrictions on imports into New Zealand, will increase their trading potential.

Conclusion

'It will be appreciated from what I have said that it is not to be expected that I can forecast if and when there will be any major change in the prevailing economic climate. So far as Group policy is concerned, your Board will give unremitting attention to preserving competitive strength and flexibility, and to promoting expansion in any direction that opportunity offers.

'In conclusion I wish on behalf of the Board to make acknowledgment of the co-operation and help which we have received from all those employed within the Group during the year. We have asked a great deal from all ranks, and there has been a splendid response.'

Joint Fire Research Organisation

REPORT OF INDUSTRIAL COMMITTEE

DURING the year ended October 1, 1957, the Committee on Industrial Fires and Explosions of the Department of Scientific and Industrial Research and Fire Offices' Committee, Joint Fire Research Organisation, met twice. They considered five main subjects.

These were the use of flame arresters and explosion reliefs for protection against explosions in gases, vapours, dusts, and oil mist; the ignition of gases and dusts by static sparks and friction sparks; a research programme on flameproof and intrinsically safe equipment undertaken by the British Electrical and Allied Industries Research Association; the hazards of non-scheduled explosive substances including organic peroxides; and flame protection practice recommended for gas appliances.

In addition the Committee also considered a range of industrial hazards reported directly by Research Associations.

The Committee are of the opinion that the hazard of ignition due to friction sparks cannot be dismissed on the present evidence. The risk with gases and vapours appears to be marginal, but it is more severe with dusts. The need for further experimental work is under consideration.

The Committee noted that experience of fires and explosions of organic peroxides seems to have been more unfortunate in the United States than in this country. This may be due to the larger bulk use of these compounds in the United States. More information is being sought on the upper limit of the amount of these compounds that may be stored safely without risk of spontaneous heating and explosion.

A hazard that has been drawn to the attention of the Committee by a Research Association is that of the rapid inflammability of clothing in oxygenated atmospheres. These atmospheres may occur in any process where compressed oxygen is available, for example in welding and burning operations where large amounts are used.

The Committee recommended that research be carried out on the spread of flame in fabrics in oxygenated atmospheres to discover the safest materials to use under these conditions. Work on this programme has begun at the Joint Fire Research Organisation.

Reviews prepared for the Committee have been published on the subjects of static electricity and flammable gas detectors. The Committee also noted with great interest the useful work on the design of explosion reliefs for drying ovens carried out for the Gas Council by Messrs. P. A. Cubbage and W. A. Simmonds [Gas Council Communication G. C. 23 and G. C. 43 (1957)]; and on flame arresters carried out at the Internal Combustion Engine Research Association. Further details of current work on combustion and explosion problems in industry are given in the Annual Report of the Fire Research Station for 1957.

The Sulphur Bogey

Complaints regarding a high sulphur content in the gas supplied in certain parts of the area, were mentioned at a recent meeting of the East Midlands Gas Consultative Council. Mr. R. S. Johnson, Chairman of the Board, said plant to deal effectively with the trouble would cost £500,000, resulting in a rise of ½d. a therm in the price of gas.

Selective Air Heating

The Halcyon selective air heating system was demonstrated recently in Leeds, to architects, builders, and local authorities from all over the West Riding of Yorkshire.

INDUSTRIAL DESIGN COURSE TO BE DEMONSTRATED

ENGINEERING employers are being invited to visit a special exhibition demonstrating a course on the design of consumer products for manufacture by light engineering industries—products such as washing machines, refrigerators, vacuum cleaners, cookers, heaters and so on.

The exhibition is to be held at the L.C.C. Central School of Arts and Crafts. It will be open from June 4-13.

The course which is being demonstrated is the three-year full-time one provided by the school's department of industrial design.

New Showroom Opened

The official opening ceremony of the Eastern Gas Board's new central showrooms at March, Cambs., was performed by Mr. M. Robinson, Chairman of March Urban District Council. Among those present was Mr. J. Hunter-Rioch, M.B.E., General Manager, Cambridge Division, Eastern Gas Board. Mr. H. W. Marsh, District Representative, will be in charge of the showrooms.

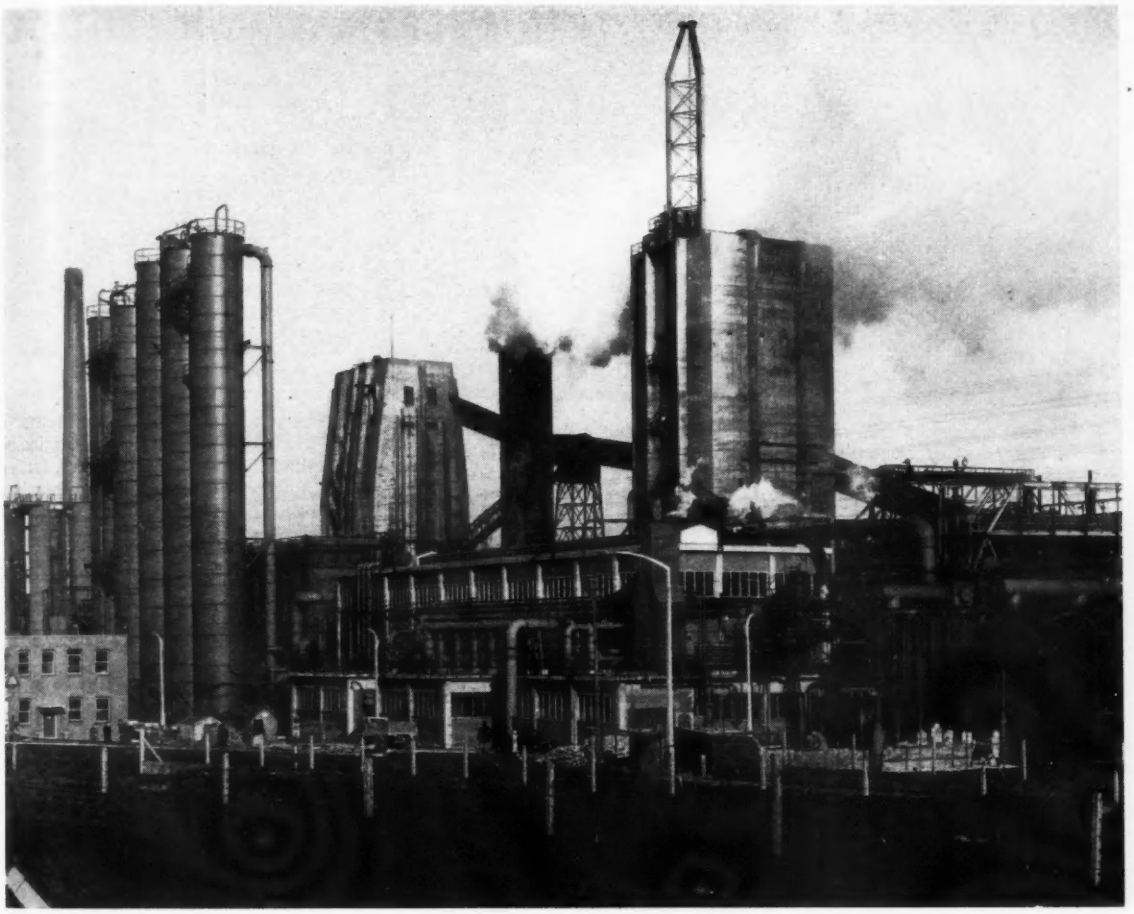
Parkinson & Cowan

Group trading profit of the Parkinson & Cowan Group in 1957 was £583,165 (against £597,497 in 1956), the annual report shows net profit after all charges was £156,760 (£171,536). Ordinary dividend paid is 9% (same), while increase in carry forward was £6,691 (£12,613).

Correction

In the report of the discussion on the paper, 'A Review of Modern Oil Gas-making Methods,' on page 646 of our March 26, issue, a contribution by Mr. S. N. Skinner, Station Engineer, Isle of Grain works, South Eastern Gas Board, was inadvertently attributed to Mr. W. Miller.

The National Coal Board's Largest Coke Oven Plant



MANVERS MAIN

THE new Manvers Main coke oven plant at Wath-on-Dearne, near Rotherham, in the North Eastern Division, is the National Coal Board's largest. Including the original batteries of coke ovens which have been rebuilt, the throughput of coal per day is approximately 3,000 tons of 0-½ in. washed coking slack.

North Eastern Division's 12 coking plants carbonised 3.33 mill. tons of coal during 1957, producing 2.109 mill. tons of coke and 18,493 mill. cu.ft. of gas. By-products included 10.3 mill. gal. of crude benzole.

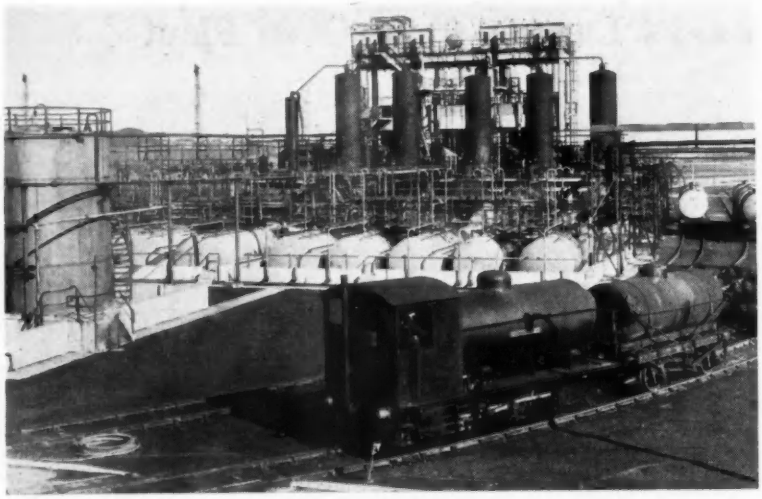
Facilities Improved

The plant at Manvers itself does not represent additional carbonising capacity, but the replacement of six separate coke oven plants by one modern plant on one site. Efficiency of carbonisation has been increased and handling facilities of coal and coke improved. By concentrating coal winding and coal preparation for neighbouring collieries on the same site as the coking plant, coal transport charges have been cut. Of the neighbouring collieries affected, coal from Wath and Kilnhurst collieries is now wound at Manvers in addition to coal from Manvers Main, while coal from Barnburgh colliery is brought overground to the Manvers coal preparation plant for washing.

In the washery schedule, arrangements have been made for the good, medium, and poorly coking coals to be washed in separate units, and transferred to the blending bunkers without risk of contamination. Here carefully controlled blending arrangements make certain that a standardised coking mixture is charged to the coke ovens for the production of metallurgical or domestic coke as the market demands.

Restricted

The site on which the coke ovens and ancillary plant have been built is restricted and cut up into four awkwardly shaped areas by railway lines. Since these lines are part of the British Railways' main line system, it has not been possible to do other than fit the plant units into these restricted areas. Beyond the northern side of the L.M.R. line of British Railways lies a more open and less restricted site, on which there were formerly an old brickyard and slurry beds. Here the coal treatment plant,



The benzole refinery plant, showing the fractionating columns in the background. In front of these are the storage tanks for pure and intermediate products surrounded by a bund which can be flooded in case of fire. In the foreground is seen the heat insulated furnaceless locomotive used for all shunting of rail tanks.

the coke handling, purifier, benzole rectification, and tar plants, the water treatment plant and the power house have been built.

Simultaneously

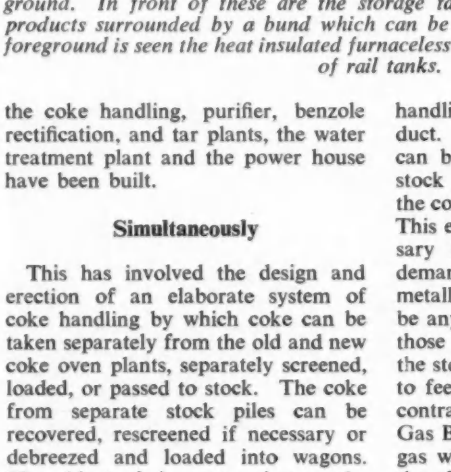
This has involved the design and erection of an elaborate system of coke handling by which coke can be taken separately from the old and new coke oven plants, separately screened, loaded, or passed to stock. The coke from separate stock piles can be recovered, rescreened if necessary or debreezed and loaded into wagons. The object of the system is to make possible the production of metallurgical or domestic coke in either of the groups of batteries, and the handling of either as a separate product. In this way, either type of coke can be treated from the batteries or stock simultaneously without fear of the contamination of one by the other. This extreme flexibility is made necessary by the possible slackening in demand by the steel companies for metallurgical coke since, should there be any recession in the steel industry, those coke producing plants outside the steel industry itself will be the first to feel it. The N.C.B. has, however, contracted with the East Midlands Gas Board to supply large volumes of gas which must be maintained. It is therefore necessary for the N.C.B. to be able to switch its production from metallurgical to domestic coke at short notice.

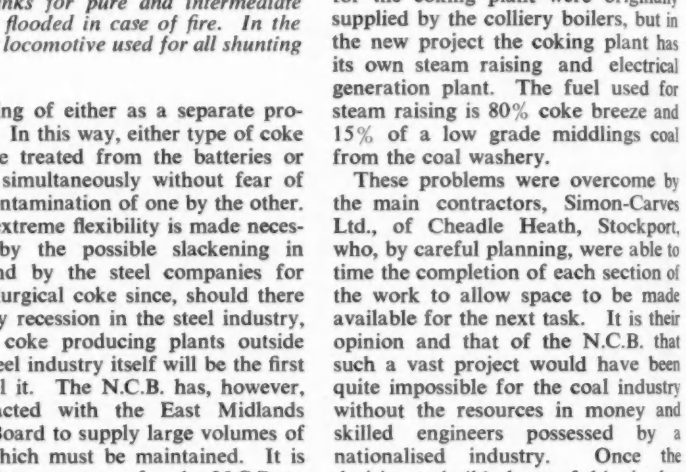
The problems to be solved in building the plant have been considerable. The restricted space available has meant that the position of every piece of plant has had to be carefully planned to avoid waste of space. The rebuilding of the old coke oven plant had to be carried out in five separate units to maintain the gas supplies and entailed bridging the empty space left by the demolished ovens to allow the coal charging car to pass over from the coal service bunker to charge those ovens which lay beyond. The building of the new batteries did not involve such difficulties and it was possible to construct a slightly larger oven and to adapt the site to include amenities for the staff.

Problems Overcome

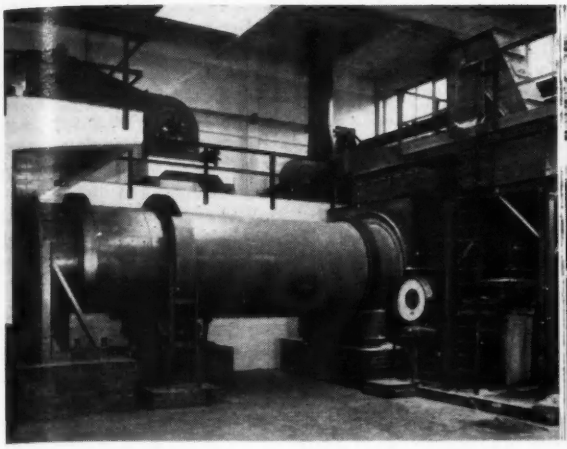
The steam and power requirements for the coking plant were originally supplied by the colliery boilers, but in the new project the coking plant has its own steam raising and electrical generation plant. The fuel used for steam raising is 80% coke breeze and 15% of a low grade middlings coal from the coal washery.

These problems were overcome by the main contractors, Simon-Carves Ltd., of Cheadle Heath, Stockport, who, by careful planning, were able to time the completion of each section of the work to allow space to be made available for the next task. It is their opinion and that of the N.C.B. that such a vast project would have been quite impossible for the coal industry without the resources in money and skilled engineers possessed by a nationalised industry. Once the decision to build plants of this size has been taken, the advantages to be gained far outweigh the difficulties and the demands made on the designers'





Left: *The acid regeneration plant in which acid is recovered from the acid-wash sludge at the benzole refinery plant.*
Right: *The two coke oven batteries on the new site, as seen from the ram side. The space underneath the ram track houses the men's canteen and wash and locker rooms.*



Left: *The rotary sulphate drier in the sulphate of ammonia house.* **Right:** *A view of the pusher at the new site. It will be noticed what a very substantially built machine it is. On the extreme left of the ram track the electrical conductors running just below track level can be seen. This avoids overhead wires.*

ingenuity to carry them out. The cost of the project was £9 mill.

The coke oven batteries may be divided into two main groups. The first group consists of the old ovens that have been rebuilt, with certain additions, adjoining the old site and amounts to a total of 71 ovens; the second group has been built on a new site and amounts to 66 ovens. The first group has had to be built in the form of five small batteries and the dimensions of all the ovens in this group are—length over sole, 38 ft. 6 in.; chamber height, 13 ft. 3 in.; mean width, 1 ft. 6 in.; and weight per charge, 14 tons of coal as charged. The dimensions had to be somewhat restricted by the limitations of the site and the conditions imposed by existing oven machinery.

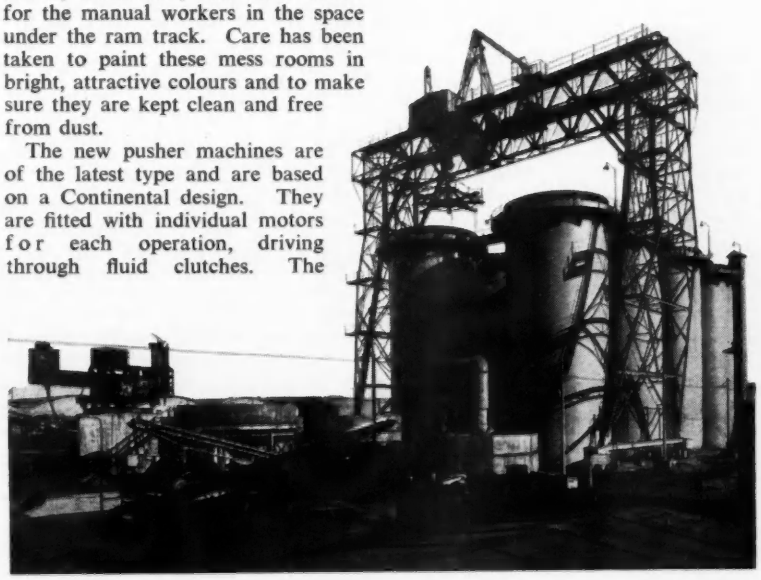
The five batteries consist of one of 17 new compound ovens, two of 15 and 13 rebuilt rich gas ovens, one from the final 14 ovens of the old 30-oven battery which have been rebuilt, and one battery of 12 new compound ovens. The total throughput from this group is 1,320 tons of coal per day. A new chimney had to be built for this group of 71 ovens since the old chimney had to be demolished to make room for a spare ram. The second group has been built as two batteries of 33 ovens and since there were no restrictions imposed as in the first group, the oven dimensions are larger. The length over the oven sole is 44 ft. 7 in.; the chamber height, 14 ft. 9 in.; the mean width 1 ft. 5¾ in., and the weight per charge is 17.8 tons of coal as charged. The throughput from this group is 1,570 tons per day, making a total for all ovens of 2,890 tons per day.

Although these ovens are the standard underjet Simon-Carves coke oven, built of a high grade silica refractory brick with the sole flues constructed of a high aluminous material supplied by Samuel Wilkinson and Sons, Ltd., of Elland, and all oven machinery is essentially orthodox, there are some points in the design of this plant, its ancillary machinery, and its ancillary by-product recovery plant, which are of interest. To save space, the ram track for the new batteries in the second group has been raised 19 ft. above ground level, unlike the design of the track for the first group where the pusher machine is supported on an elevated steel framework running on a track at ground level, making it possible to accommodate locker-rooms, bathrooms, and mess rooms for the manual workers in the space under the ram track. Care has been taken to paint these mess rooms in bright, attractive colours and to make sure they are kept clean and free from dust.

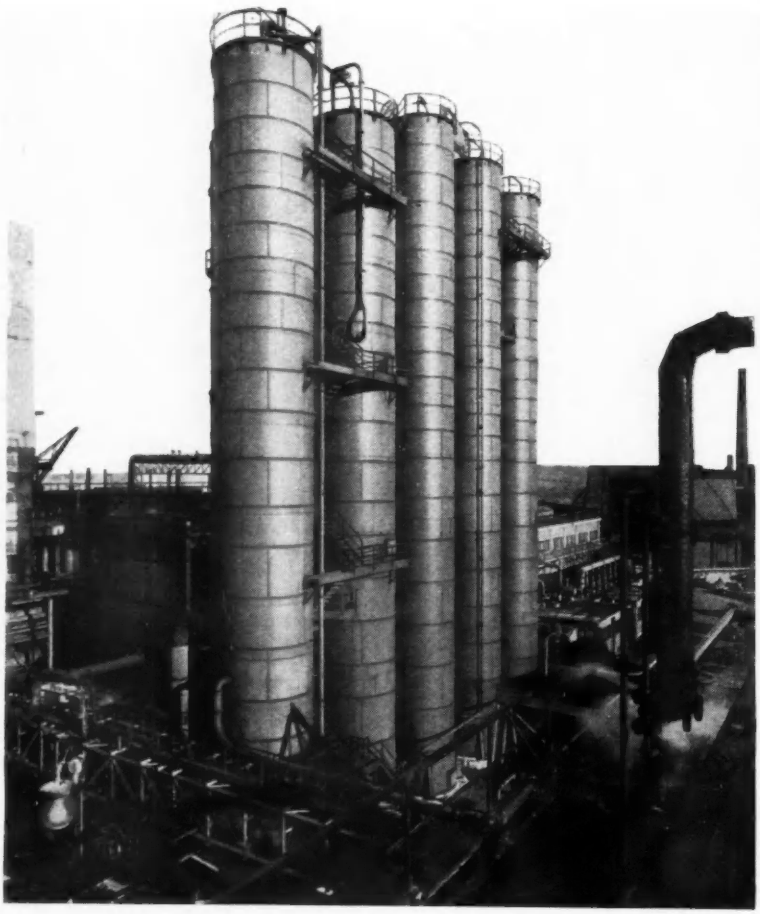
The new pusher machines are of the latest type and are based on a Continental design. They are fitted with individual motors for each operation, driving through fluid clutches. The travelling motors are fitted with 'Microsen' gears which enable the ram to be quickly and accurately centred. The movement is particularly smooth and free from the tendency to jump which is so noticeable with normal inching controllers. Should the power supply fail, the ram can be operated at reduced speed by a compressed air motor.

No Vibration

The charging cars are of the usual design but the three-point suspension, formed by mounting the travelling wheels in bogies, with the bogie frames riveted to the chassis on one side and mounted on the other side in pin bear-



A view of the purifier plant showing the Holmes tower purifiers and the goliath crane used in handling the containers. On the extreme left in the background is the experimental machine for emptying oxide containers mechanically.



A view of the five crude benzole scrubbers at the new ancillary plant.

ings with hydraulic dampers, prevents 'crabbing' and vibration. It is noticeable how silent all the oven machinery is in operation. This absence of vibration reduces the wear on the top brickwork. All machines operate on 110 volt, 3 phase A.C. supply. On the old site a new set of machines has been provided in addition to those in use before rebuilding and the power supply standardised so there are now two sets available for this site.

Latch Gear

The coke-oven plant has self sealing doors throughout, but the new ovens in both groups have a new type of latch gear by which the door is tightened onto its seating by its own weight instead of by the conventional rose and screw. The new door, known as the G type, has two toggle arms pivoted to the door body which engage with the latch hooks and its weight acting through these toggle arms forces the sealing strip on to its seating. To remove the door, its weight is taken by the extractor head and the toggle arms are raised by the operation of a screwjack until the latch bars are clear of the hooks. The door is withdrawn in the usual way.

To ensure that perfect alignment between pusher and coke guide has been achieved before the pushing of a charge begins, the N.C.B. are experimenting with a magnetic device operated from both ends of the oven, which, if alignment is faulty, prevents pushing by cutting off the power to the ram motor. Door changing and ram changing stations are provided at either end of each site. The maintenance of the doors is carried out continuously by changing doors from each side of the batteries periodically after a predetermined number of days.

As already mentioned, the batteries on the old and new sites have separate conveying systems to the main coke screening plant so that different types of coke can be kept separate if necessary. The coke wharf conveyors from each site meet at a junction tower from which two parallel conveyors cross the main railway line in a single gantry to another junction tower on the far side; two further conveyors lead thence to the main screening plant where each conveyor feeds its own line of grizzley screens for run-of-oven coke.

The oversize from the grizzley screens may be delivered either to rail wagons by boom loaders or to the stocking ground. Coke under 2½ in. may be fed either to secondary screens or to the stocking ground. A proportioning device enables some or all of the run-of-oven coke to by-pass the grizzley screens and to be fed through a cutter to the secondary screens or to the stocking ground.

The secondary screens are fed from a hopper distributing to three double-deck vibrating screens, the through coke from which is conveyed to a second stage comprising three more double-deck screens. Graded coke is conveyed to domestic bunkers with five 30-ton compartments for coke breeze and four sizes of nuts; these deliver graded coke either by vibrating feeders and de-breezing screens to rail wagons, or by conveyor to the stocking ground or the boiler house hoppers. The boiler house conveyor can also receive coal from the washery.

Control Desk

Run-of-oven or screened coke can be handled in and out of stock at 200 tons per hour. Coke for stocking out is conveyed to the feed hopper of an aerial ropeway system; alongside the delivery conveyor is a reclaiming conveyor fed from the ropeway through a buffer hopper. Reclaimed coke can be delivered either to the grizzley screens or to the domestic bunkers.

Adjacent to the contactor room of the main screening plant is a control desk with a mimic panel, consisting of a geographic line diagram of the whole coke handling and screening plant with indication lights to show the actual flow of coke. The required flows are chosen by selector switches and brought into operation by push buttons on the control desk.

The shortage of space at the old site and the enlarged carbonising capacity there has made it necessary to bring crude gas up to the new ancillary plant installed at the new site. Gas from the new 66-oven battery meets gas from the rebuilt 13-oven and 14-oven batteries at the inlet of primary condensers.

In this way the new ancillary plant deals with gas from the carbonisation of about 2,000 tons of coal a day, leaving the old plant a rather smaller volume of gas than before. The old ancillary plant comprises primary condensers, exhausters, a detarrer, ammonia scrubbers, and benzole scrubbers. Gas for heating the ovens on the old site is taken from the outlet of the benzole scrubbers through two Askania governors. Surplus gas

enters the outlet main of the new plant.

Liquor from the ammonia scrubbers is worked up in a concentrated ammonia liquor plant built on the new site by Chemical Engineering Wiltons, Ltd., a Simon-Carves subsidiary company. Although this concentrated ammonia plant handles the liquor from the old plant, it is located on the new site. It also includes the still for the liquor from the new plant, though this does not amount to a large quantity since all the ammonia from the new plant is recovered by a semi-direct ammonium sulphate plant. A vapour line carries the vapour from the latter still to the inlet of the saturators. Both stills are served by a single liming plant.

Detarrers

At the new plant there are five vertical water-tube condensers (one spare) working in parallel, with provision for a sixth, and two turbo-exhausters (one spare) driven by back-pressure steam turbines. The detarrers are of standard Simon-Carves tube type with riveted shells. From the detarrers the gas passes to two saturators (one spare). Salt from the saturators is elevated to a settling cone feeding either of two Watson Laidlaw horizontal centrifuges, from which it is conveyed to a Dunford & Elliott dryer in the salt store; the dried salt is elevated to a hopper, from which it can be bagged or loaded by belt to wagons or to stock. Recovery from stock is by belt conveyor.

Gas from the saturators enters the direct secondary cooling towers, of which there are two in series, a naphthalene washing section being included. The cooled gas passes to three benzole scrubbers in series; the scrubbers have wooden grid fillings, and the washing medium is creosote oil. The gas handling plant at the outlet of the benzole scrubbers is common to both the old and the new plants. The heating gas for both groups of batteries is taken from this point, at which an existing 750,000 cu.ft. spirally guided holder is connected to balance the supply. From this point, too, a connection is taken to the triple bleeder mounted on the top of the service bunker of the 66-oven battery. The gas for sale passes to two static ring-packed naphthalene washers in parallel, each having six washing chambers with corresponding circulating pumps. The washing medium is gas oil, which is regenerated in a plant adjoining the washers.

The dilution gas main will be connected to the outlet of the naphthalene washers, and provision will be made for automatic regulation of the calorific value of the diluted gas. From the outlet of these washers the gas stream divides again. About 4 mill. cu.ft. per day of unpurified gas is separately metered and pumped to the Gas Board at Swinton and Mexborough by two compressors, each of 4 mill. cu.ft. per day capacity, while the remainder amounting to about 15 mill. cu.ft. per day is passed to fan boosters which deliver it to the purifier plant on the other side of the main railway line. The purifiers are Holmes tower purifiers, 27 ft. 6 in. diameter by 71 ft. high. The plant includes all the necessary cranes and mechanical handling gear. The N.C.B. are experimenting with a means of emptying the oxide containers mechanically.

Four Compressors

At the outlet of the purifiers the gas enters an existing 750,000 cu.ft. spirally guided gas holder which is used to balance the supplies to the gas grid. The gas is metered by a 24 mill. cu.ft. per day Holmes-Connersville meter and is delivered by compressors to the gas grid. There are four compressors each of 6 mill. cu.ft. per day, with space for a further two, one of which is steam driven, one electrically driven, and two dual driven. In each

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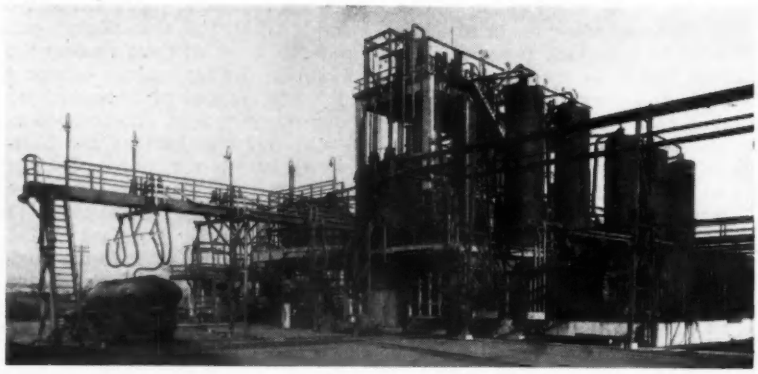


The benzole refinery showing the secondary stills and the fractionating columns on the right and the loading arranged for the export of all products by road tanker.

case the electric motors are housed in a separate motor room and the drives to the compressors pass through a gas-tight gland. The choice of drives means that varying gas loads can be handled with the utmost economy of steam and electricity without using variable speed motors. The compressed gas is cooled in indirect after-coolers from which it passes to the grid.

Rectification Plant

The expansion of the carbonising plant has made it necessary to increase the capacities of the crude benzole and the benzole rectification plants. A new rectification plant has been built on the further side of the railway and the rectification units from the old plant have been transferred there as part of the new installation. The crude benzole recovery plant has now been concentrated at the old works and consists of three stills complete with oil heaters, columns, debenzolised oil coolers and naphthalene trays, two sets of which have been newly installed. The crude is pumped to storage tanks at the new rectification plant or refinery which can handle 15,000 gal. per day, representing the whole of the Manvers crude, and 1 mill. gal. per year imported from other works. The new benzole refinery is one of the most up-to-date plants of its kind and is the result of many years' experience in working up aromatic products of this type from coal carbonisation. Benzene and toluene were being produced at Manvers during the first war but between the wars these products were discontinued with the increased demand for motor spirit. They were resumed during the second war when a steady market for them was built up. The increase in the carbonising capacity of the works has also favoured development in this direction.

The plant consists of two defronting columns, six batch stills, each with its own fractionating column and three washers. The plant also includes an acid regeneration plant for freeing the acid recovered from the benzole washers from tar and making available a dilute acid which is used in the sulphate plant. There are full facilities for handling incoming crude from other plants and outgoing products. There is a self-contained built-in firefighting installation. All the storage tanks for the distillation products, both pure and waiting further processing, supplied by Hatchett & Co. Ltd., of Hyde, are contained in an enclosure, which can be flooded with foam in case of fire.

The crude benzole is defronted to remove the low boiling volatile organic sulphur compounds, followed by washing with once used acid and then distilled in the primary stills. This primary distillation gives either motor spirit semi-pure products. The motor spirit is run off to storage tanks but the semi-pure products are washed again with strong acid and redistilled in the secondary stills. The distillation columns work on the pumped reflux system and are capable of producing a wide range of pure products. At this plant, three grades of pure benzene of different specification, toluene, xylene, and solvent naphthas are in regular production. The plant is fully instrumented and automatic controllers are fitted to regulate the stills and columns.

Steam for the plant at 140 to 150 lb. per sq. in. gauge and 500°F. is received from the back-pressure turbines in the power house and passes to a desuperheater before entering the heating coils of the stills. Low pressure steam at 15 lb. per sq. in. gauge is recovered from the exhausts of the reflux and circulating pumps and is used as direct steam in the defronting columns, the acid regeneration plant, and also for heating the condensate used in the anti-freeze coils in the pure benzene tanks. Any surplus condensate is added to the clean water circulation system which supplies the condensers by way of a water cooling tower. To avoid danger of fire, all shunting of rail tanks and other wagons on the benzole plant sidings is done by a thermally-insulated furnaceless locomotive.

Steam for electric power generation is raised in three Simon-Carves boilers, fitted with automatic control and each capable of raising 60,000 lb. of steam per hour at continuous maximum rating but capable of 70,000 lb. per hour at a continuous peak load rating. The boilers are of the tri-drum twin-circulation type with water-wall combustion chambers. Each boiler is equipped with a superheater, non-contact type desuperheater, economiser, single-grate mechanical stoker and two gas burners in each side wall. Steam at 625 lb. per sq. in. and 815°F. passes to two Parsons back pressure turbo-alternators, which exhaust the steam at 160 lb. per sq. in. gauge and 550°F. Two steam reducing valves in conjunction with two spray type desuperheaters are used for this purpose when the turbo-alternators are shut down.

Future

The boilers are fired either sandwich-wise by coke breeze and coal (low grade middlings) or by coal and coke oven gas, with the provision for future firing by coal and tar fuel. Ash and grit are collected in hoppers and discharged into a submerged ash conveyor in the basement from which they are conveyed to an ash bunker for removal by lorry.

Power is distributed from the power house through three 550 V. fused distribution boards.

Provision has not yet been made for the production of a diluent gas for adjusting the calorific value of the outgoing gas to the East Midlands Gas Board's grid. It is proposed to use untreated small coal to generate producer gas for this purpose, since the use of coke would be too expensive. This also applies to the firing of the batteries of compound ovens on producer gas. At the present time, it has been calculated that the cost of producer gas from coke for underfiring would be about 5s. per 1,000 cu.ft. which compares adversely with rich gas underfiring at 2s.3d. per 1,000 cu.ft. Information is being sought, however, on the possibility of installing slagging producers which would make use of low grade fuel and which would reduce the cost of producer gas considerably. Such a step would greatly increase the available volume of coke oven gas for disposal to the Gas Board.

The D.K.H. 'Controlled Flow' Coke Oven

THE D.K.H. or Didier-Kogag-Hinselmann coke oven, built by Didier Werke, A.G., of Essen, Germany, is now being built under licence in this country by Drakes-Didier-Kogag, a subsidiary of Drakes, Ltd., of Halifax. Special features in the design of this coke oven are claimed to have overcome difficulties in obtaining uniform heating. This is particularly important at the present time, since the need for reducing the cost of coke production involves mechanisation of larger coke producing units and, as far as possible, a reduction in the consumption of gas for underfiring the coke oven battery.

The need for larger production units has meant that individual ovens must have a greater capacity and higher heating flue temperatures to increase the throughput per oven, rather than the addition of more small ovens or an increase in the number of batteries. To realise this in practice, it has been necessary to find some means of uniformly heating an increasingly tall oven wall, to raise the overall temperature by building it in a high grade refractory such as lime bonded silica, and designing it in such a way that it will be sufficiently rigid to withstand the stresses and strains of the arduous pushing schedule of the modern coke oven plant. For obvious reasons the increase in capacity has been achieved by building a taller oven wall, rather than by increasing the width of the oven. The present average width of about 18 in. or 450 mm. gives large enough coke when this quality is particularly demanded and a sufficiently high rate of heat transference from either side of the charge to make possible a reasonably short carbonising time at maximum coal throughput and at a reasonable flue temperature.

Great Step Forward

In the past, a great deal of ingenuity has been used to design a system capable of employing these large modern ovens and of carbonising the charge with the greatest thermal efficiency. The advent of the regenerator for returning heat to the system from the outgoing waste flue gases was a great step forward. This idea superseded the waste heat type of coke oven because, perhaps, the needs at the plant were better met by making available large volumes of coke oven gas than by saving quantities of cheap solid fuel for steam raising and consuming all the gas. Even so the evolution of the coke oven is still going on, with the object of reducing the heat requirements of the coke oven battery by the more efficient use of the heat recoverable in the regenerator and a still greater reduction in the consumption of gas. The quality of coke and by-products is influenced by the uniform heating of the oven wall and so is the consumption of gas, so the D.K.H. oven is of particular interest in that it claims to have solved this particular problem by modifications to the regenerator. In the description of the plant that follows, the problem of gas flow in the flues themselves is discussed and the solutions to the difficulties explained. Present day experience demands economy and low operational costs in modern coke oven design. Attention to the following items makes still greater economies possible.

(a) Reduced consumption of gas for underfiring.
(b) Improvement in coke quality by adequate heating application.
(c) Increased yields of raw gas and by-products.
(d) Increased throughput of the ovens.
(e) Greater life of the oven structure by robust methods of construction and the use of improved types of refractories.

The modern coke oven must also be sufficiently flexible in operation to accommodate wide variations in the coking time and the coke oven designer must strive to combine increased mechanisation with increased safety for the operatives. The D.K.H. oven has been developed on these lines and special attention has been paid to flow characteristics with remarkable results in the gas consumed for underfiring and in the uniformity of heating.

The economics of coke oven working largely depend on the quantity of gas consumed for underfiring which supplies the heat needed for the carbonisation of the coal together with the heat lost at exposed surfaces and the heat lost in the waste gases. The quantity of heat needed for carbonisation depends on the type of coal and its physical condition. The total heat needed for the carbonisation of Ruhr coals is shown in Fig. 1.

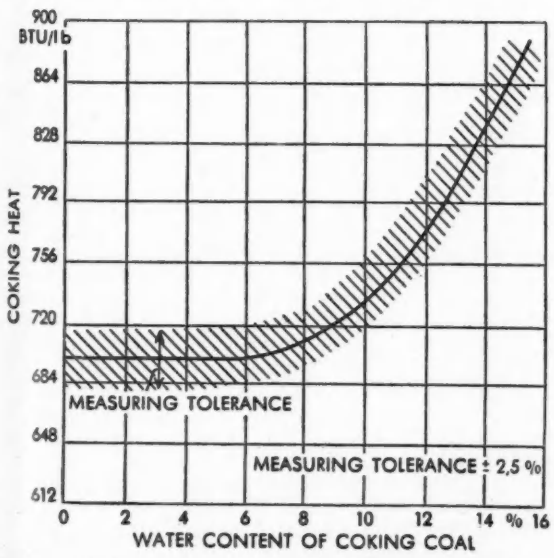


Fig. 1. Heat necessary to carbonise Ruhr coal in B.Th.U. per lb.

Surface Losses

The surface losses from the ovens to the atmosphere can be effectively controlled by adequately insulating the coke oven structure. These losses per unit area and per unit time depend to some extent on the carbonisation period and so on the temperature of the heating flues. The loss per unit weight of coal throughput will also depend on the size of the battery, the width of the oven, the capacity of the oven, and on the carbonising period. Under normal conditions the surface losses are estimated at about 70 to 130 B.Th.U. per lb.

Waste gas losses depend on the magnitude of the chimney draught that has to be maintained and the heat absorbing area of the regenerators. The minimum temperature necessary to attain this draught in a natural draught chimney represents the minimum heat losses in the waste gases. Any greater reduction would almost certainly involve the construction of larger regenerators or even the installation of some means of forced draught, the capital cost of which would not be economic. The corrosive qualities of the waste gas at low temperatures also

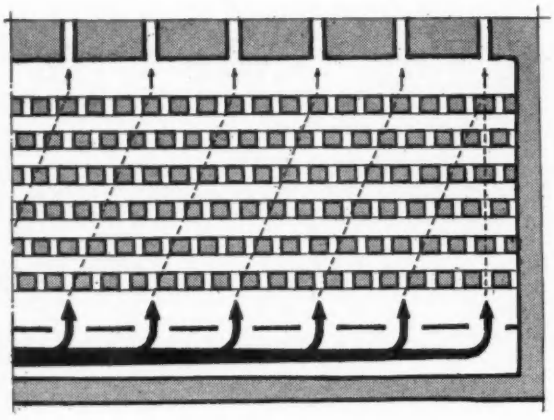


Fig. 2. The path of air or lean gas passing through the ordinary type of regenerator.

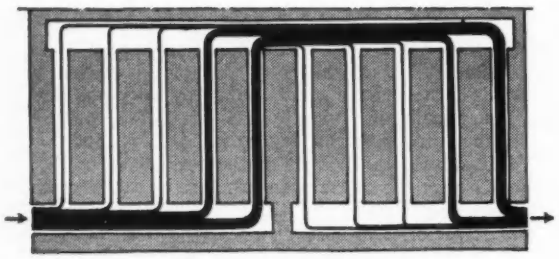


Fig. 3. The volume of heating gas shown diagrammatically (volume proportional to thickness of line) travelling in the various flues of a coke oven heating wall.

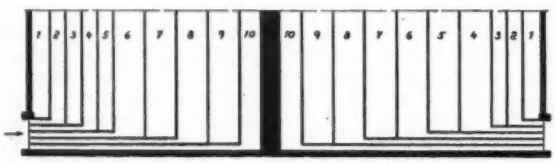


Fig. 4. Diagrammatic representation of the division of the regenerator and sole flue for the 'flow-controlled' oven.

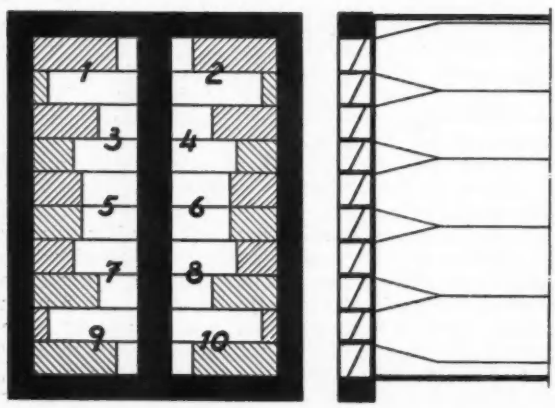


Fig. 5. Diagrammatic representation of the divided sole flue behind the air box.

have to be considered. This corrosion is more noticeable with rich gas than with lean gas heating.

It is generally agreed that although a coke oven has been well insulated and has sufficiently large heat exchange surfaces, it does not necessarily show the lowest gas consumption. The most important feature is uniformity of heat application. Should the temperature of any parts of the oven wall which are in contact with the coke differ from the remainder, local overheating occurs caused by the application of unnecessarily large quantities of heat to the coal being carbonised. To produce a coke of uniform quality, high market value and uniformly carbonised both vertically and horizontally together with the maximum yield of by-products at the normal coking temperature, a most efficiently controlled heating system for the oven walls is essential. Special consideration of the flow conditions in a coke oven is, therefore, of primary importance.

Fundamentals

All coke oven systems are equipped with flues from which rich or lean gas and air are distributed to single individual flues into which the waste gases are collected on combustion. The design of the distribution and collecting flues is in accordance with certain laws by which the flow of gases can be calculated and the knowledge of these fundamentals applied to coke oven heating.

In all known systems of regenerative coke ovens, there are one or more flues for each oven unit serving alternately as collecting and distribution flues. These flues operate for one-half of the reversing period for the distribution of fuel gas and air, and for the other half of the reversing period for the collecting of the products of combustion. The effect of the flow increases if these flues are connected in series, but it is unimportant at which point of the coke oven the flues are located. According to the laws of the flow of gases, the dynamic pressure is higher at the beginning of the distribution flue where the flow volume is large, than at the end of the flue where most of the gases being distributed have already been dispersed. The dynamic pressure will, therefore, be at its lowest at the end of the flue. The static pressures will clearly be low at the beginning and high at the end of the flue, since the total kinetic energy of gas remains constant throughout the flue except for minor reductions due to friction and deflection losses.

Regulating Devices

This pressure variation does not follow a straight line and, therefore, special attention must be paid to the first and the last heating flues. The quantities of gas passing from the distribution flue depends on the design of the flues and the speed of the gases passing through them, which will vary with the operational conditions of the coke oven, for instance the carbonising time. It is generally agreed that larger quantities of gas will pass through the single flues situated near the closed end of the distribution flue unless special regulating devices are applied. After the reversal of the gas, the flue which previously served as a distribution flue, becomes a collecting flue, and receives the waste gases from the smaller individual flues. Under these conditions, energy losses are greater than those during distribution and the static pressure at the open end of the collecting flue is lower than at the closed end. The waste gases in the flues located near the open end of the collecting flue will, therefore, pass into this main flue in considerably greater quantities than those in flues located near the closed end of the main collecting flue.

Conditions in the collecting flue are therefore exactly the reverse of those in the distributing flue. For the same flues to work equally well in the two rôles, there should be

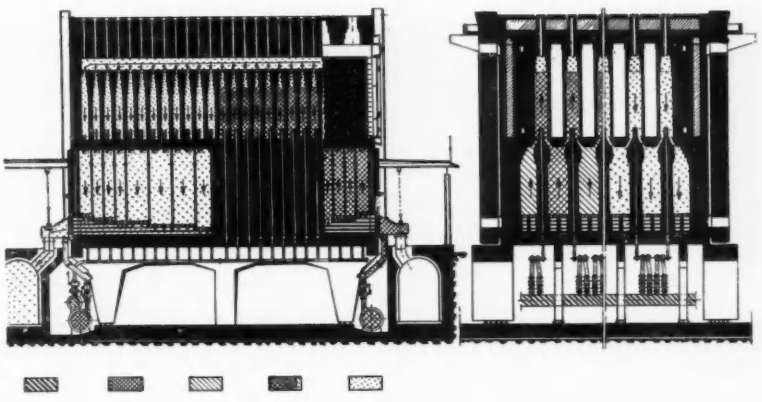


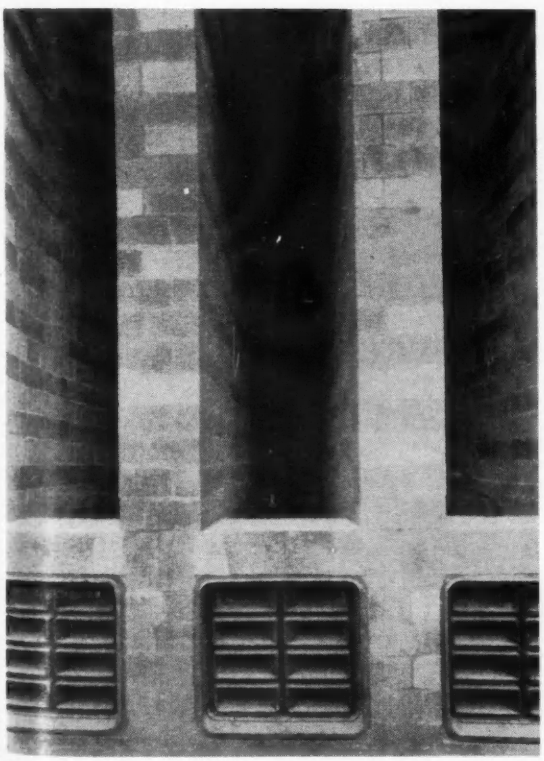
Fig. 6. A section through a coke oven plant equipped with the under-jet system of rich gas firing with the 'flow-controlled' regenerator.

Key, left to right: *Rich gas. Lean gas. Preheated air. Burning gas. Waste gas.*

some form of adjustment by which the flues could be made to carry out this double purpose. In most coke oven systems a compromise is reached by adjusting the passages between the distribution flues and collecting flues and the single individual flues leading out of them. In this way an average value is found for these flues in either rôle. Clearly this cannot be a satisfactory solution since it consists in throttling back a chimney draught which represents heat losses from the battery.

Conditions of Flow

Another instance of irregular flow of gases occurs when lean gas or air is flowing along a distribution sole flue underneath a regenerator filling and is passing up through undivided checkerwork to several heating flues. The conditions of flow are even worse if the preheated lean gas or air is collected in a distributing flue above the checkerwork before entering the individual flues. Such an arrangement is necessary when the gases must be taken to the other half of the oven by a 'scissors' flue. It has been found that the static pressure in the collecting flue above the checkerwork is not constant along its length so that the gases will not pass vertically upwards from the sole flue at base of the regenerator but will pass to points of lower pressure by the shortest possible route. (See Fig. 2).



External view of an empty regenerator showing the cast iron frames at the entrance to the sole flue to which the air boxes are attached and which allow individual adjustment to the regenerator cells.

To be able to take full advantage of the heat exchange surface of the regenerator filling and to make quite certain that equal quantities of heat are passing from the regenerator along the individual flues to the combustion chambers, throttling at certain points must be used to even out the pressure throughout the heating system. The gas flow is particularly sensitive to changing conditions in the running of the battery so that, if the carbonising time is changed, it will be necessary to readjust all dampers to maintain uniform heating. This is often either impossible or difficult and time consuming so it is generally arranged that such adjustments should be set at an average position whereby reasonably good conditions of heating can be realised under all conditions of working the battery.

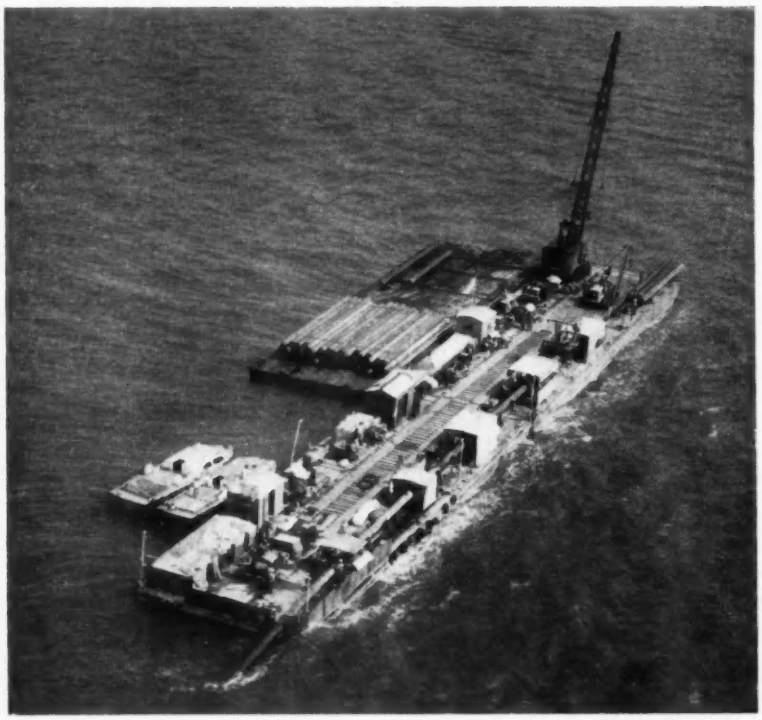
In the half divided oven, there is a horizontal flue above the heating flues along the whole length of the heating wall. Its purpose is to collect the waste gases produced from the combustion of the gas burning in one half of the wall and to remove them in corresponding proportions to the heating flues in the other half of the wall which is idle.

High Static Pressure

Assuming that all the heating flues of one half of the heating wall are connected to the whole of the regenerator space of the same half of the heating wall, quantities of preheated lean gas or air will be led directly to the heating flues by way of short flues located between each heating flue and the regenerator. There will be a high static pressure at the end of the distribution flue beneath the regenerator in the gas burning half of the wall, but the corresponding static pressure in the horizontal flue which acts as a means of collecting waste gases will be low at the middle of the heating wall. Here the differential pressure will be greatest and lean gas and air will flow upwards towards this point at a greater rate than anywhere else along the wall. To overcome the uneven heating which will result, these flues will have to be throttled back more than other flues along this half of the heating wall. After the change over of gas and air at the end of the burning period in this half of the wall, fresh adjustments would be needed to maintain uniform heating. This is shown diagrammatically in Fig. 3.

Continued on p. 94)

New York Consumers Burn Gas Originating 30 ft. Below the Gulf of Mexico

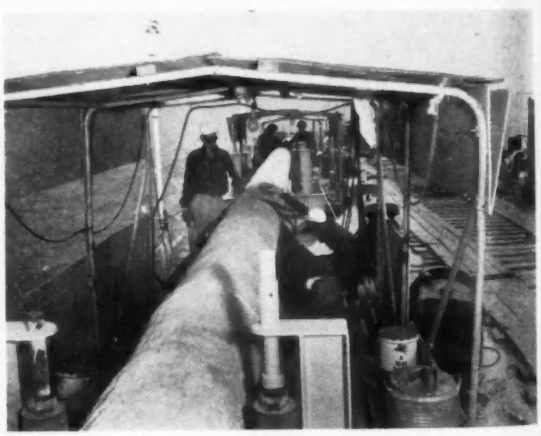


UNDERTAKINGS in the New York-New Jersey-Philadelphia metropolitan area are now distributing gas that, in part, orginated 7½ miles off the coast of Louisiana in the Gulf of Mexico, 1,200 to 1,500 miles away from their service areas. Transcontinental Gas Pipe Line Corporation connected its main line to an oil and gas well that had been drilled over 30 ft. of water as a joint venture by two producing companies.

The 'Mecon Platform,' pictured right, is the point where Transcontinental Gas Pipe Line Corporation's submarine connection to its main line terminates. Under this permanent installation it takes gas for delivery to the undertakings.

Pictured left, a floating pipeline factory is seen working its way from the coast of Louisiana to the 'Mecon Platform' during the development stage. The special barge was equipped to handle every operation that would be performed in overland pipeline construction.

The smaller barge at the crane-end of the longer one was loaded with 16-in. pipe that was coated with asphalt enamel and then covered with heavy concrete at a plant onshore. The 40-ft. pipe lengths were lifted to the construction barge as needed and placed on the production line.



As pipe was joined and prepared for laying, it was rolled off the ramp and into the water. It can be seen at the lower end of the long barge as it dipped below the surface. The two smaller boats tied up at the same end were used to transport personnel.

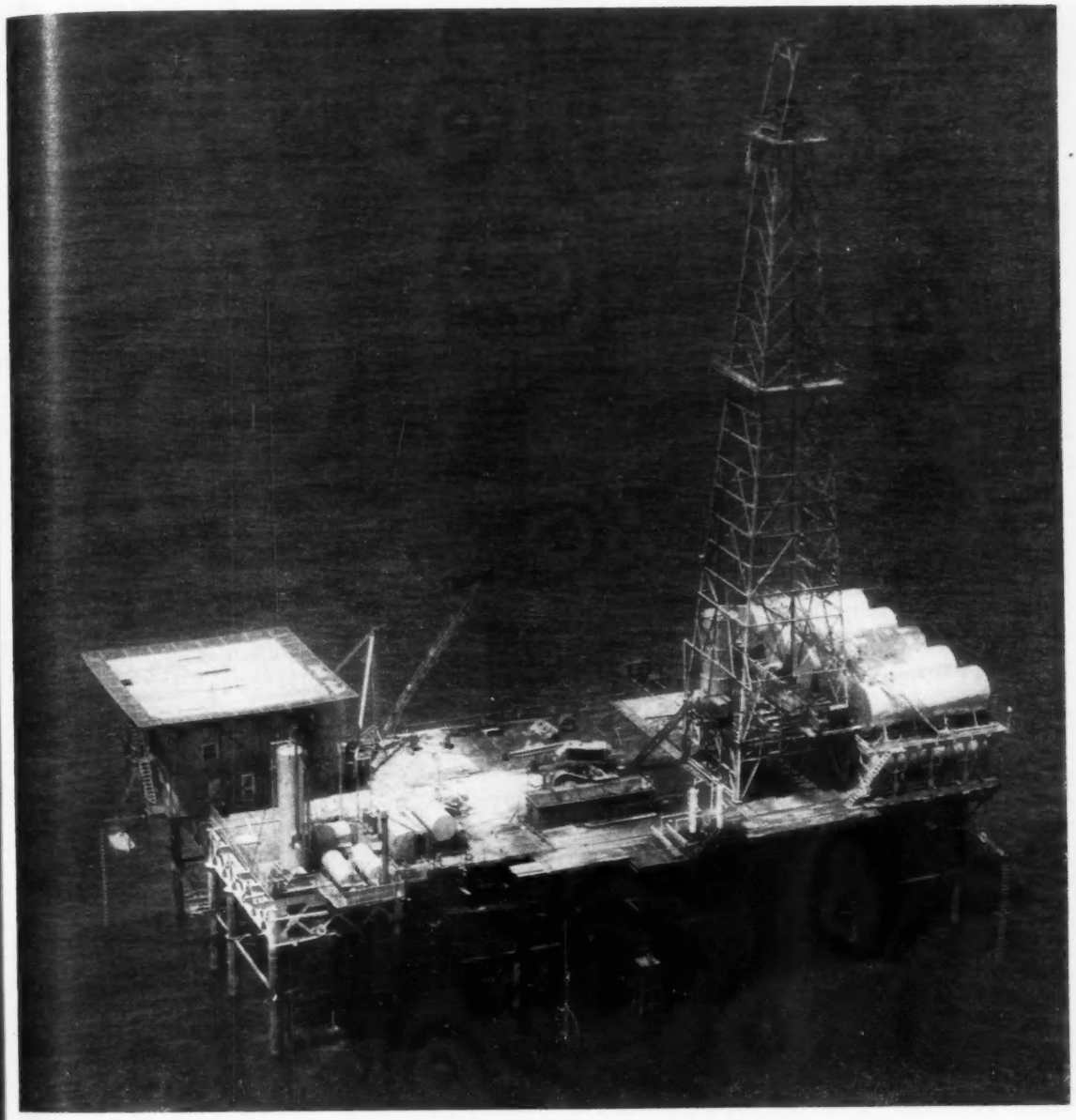
The sheds that straddle the pipeline along the near-side of the factory barge are work stations. They are shown in more detail in the four smaller pictures (work on this project was on a 'round-the-clock' schedue). Left to right:—

1. A sideboom tractor lifts a 40-ft. pipe section to the assembly line for welding to the preceding section. This view looks toward the two upper work stations in the aerial view.

2. The first of the welding stations on the production line. Note that it has lighting for night-time operations and hinged weather guards. After welding, every joint was inspected visually and by radiography before it was approved. Following approval, the pipe was moved on the rollers to the coating and taping station for full protection of the welds.

3. At the final station, the newly-welded joints were prepared for the heavy coating of concrete. The barge included a concrete mixing plant, located opposite this station at the stern of the barge.

4. After the entire line had been laid on the floor of the Gulf of Mexico, this barge traversed the course of the line applying high-pressure water jets alongside the pipe to dig a ditch. When this operation was completed, the new line was buried 3 ft.



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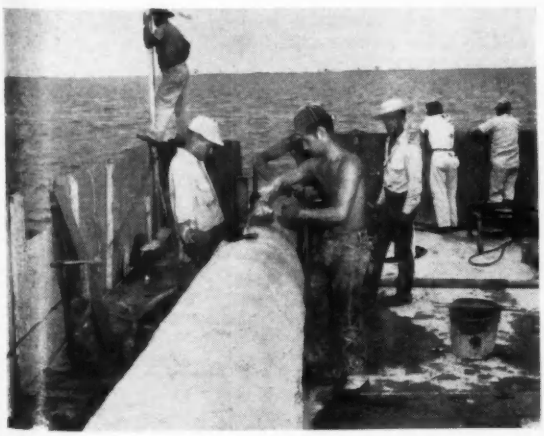

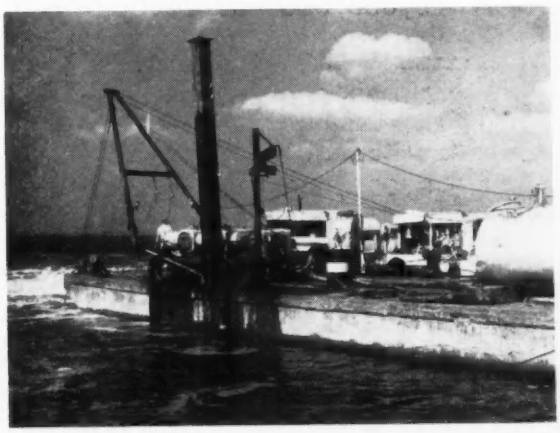

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*With sulphur extraction plant.

Comprehensive technical literature is in the course of preparation, in the meantime future announcements will outline some of the advantages of this type of plant.

From a paper to the London and Southern Junior Gas Association, March 14, 1958.

The Gas Industry in the Atomic Age

By J. G. KING, O.B.E., D.Sc., Ph.D., Hon.M.Inst.Gas E.

IN the field of national energy supply the gas industry occupies an important place. It takes some 12% of the coal mined and converts it into other forms of energy which can be applied with a higher degree of thermal efficiency than can the raw coal, as well as providing coal tar and chemicals for industry and for roadmaking. In addition, it processes oil and oil products, and natural gases, to a final value which represents 14% of the thermal value of the coal and oil mined in Britain today. The magnitude of this achievement is great, but the problem before us today is whether it can be maintained in the coming years, particularly when the utilisation of atomic energy is fully established, or whether it must find some new economic level, and whether this level will be greater or less than at present.

In the coming years the gas industry, as a supplier of fuel energy, will have two main competitors, apart from raw coal, of oil and electricity, but all of them will be operating in a world of expanding energy demand. Before we can assess what may happen to the gas industry we must place this demand in perspective. At present, the total coal equivalent of national energy demand is about 255 mill. tons a year.* The promise from nuclear energy is that the present small contribution from Calder Hall (0·2 mill. tons) will become 80 mill. tons (24,000 MW) by 1975 when it may represent 80% of electricity production. By this year it is estimated that the demand for national energy will have risen to 375 mill. tons at an annual rate of about 1·6%.

Serious Problem for 1975

With such a promise we might say that the era of atomic power has already begun, but we should realise that 80 mill. tons promised does not cover the total increase of demand of 130 mill. tons, that it will not displace existing sources of energy, and that other forms must contribute to make up the total demand. It is clear that coal cannot be expected to contribute more than a further 23 mill. tons, which leaves oil to supply the balance of 27 mill. tons. When one looks at this high figure for oil—the total would be 65 mill. tons—it is evident that a serious problem could exist in 1975 in the importation of so large a quantity. Consumption in 1956 was only 38 mill. tons, of which not more than 20 mill. tons could be described as fuel oil, even including the 3·7 mill. tons consumed in the refineries. It does not seem that the demand for transport fuel can rise very much more, so that the increased demand must be presumed to be in industry. The idea, however, of an industrial increase of from 20 to, say, 45 mill. tons in this period, does not seem to make good sense, but without an enormous increase in the nuclear energy programme, there does not seem to be any alternative. The new total in 1975 means about 40 mill. actual tons of petroleum.

From this data we might visualise the new era as making a real beginning in 1975 with electrical energy destined to take the important place. This is not because it is the ideal form of energy but because it is, so far, the only form of energy which can be conveniently prepared by the process of atomic fission, and is the only method available as yet to fill the gap between energy demand and supply. How this energy is to be applied is another matter.

In recent years the use of electrical energy has been increasing rapidly: In 1954-55 the consumption of fuel for its production was 42 mill. tons, but by 1956-57 this had risen to 48 mill. tons at the rate of over 7% a year. Much the greater proportion of this is produced in our large power stations and it is the policy regarding these which will be the deciding factor. It was stated on high authority that no new stations would be built for pulverised-fuel firing, and that all new stations would be based on nuclear energy, but more recently it has been decided to discontinue developments in the use of oil in order to make use of the surplus of fine coal which mechanised mining is producing in excess. It is not clear exactly what this means and there would seem to be two possibilities: (a) That pulverised fuel stations will be maintained at their present level of 48 mill. tons, when the addition of 90 mill. tons of nuclear energy will give a total of 130 mill. tons in 1975, or (b) that production of electricity from coal will taper off as nuclear energy comes into full action. The second alternative does not seem wise since it would aggravate the oil position; the answer is, more probably, that the use of pulverised fuel for power stations will increase even beyond the present level. It constitutes the only real means of disposing efficiently of our surplus of weakly-caking fine coal.

The prospective figure of 130 mill. tons represents an immense load and its very magnitude raises the important question of whether it can be efficiently utilised. In 1956 the output of electricity from power stations was 78 × 10^9 kWh (including industrial plants) and industry consumed some half of this, and the domestic office, and shop market about two-fifths. If the much-higher output of 210 × 10^9 kWh is to be utilised effectively it must be used in the form of electrical energy since it is not yet a practical possibility to employ as such the heat developed in the uranium pile.

Speaking at the annual meeting of the Institution last summer, Dr. Dunsworth touched briefly on this latter point, saying that a considerable development effort would be necessary in order to achieve this, particularly in order to control dangerous radioactive emanations. Heat could actually be made available now from a carbon-moderated pile such as that at Calder Hall, but not above a temperature of about 350°C. He said that it might take 15 years before this level could be safely raised to 800°C. The recent remarkable advance reported in the control of the hydrogen—helium reaction, without dangerous emanation, to make heat available at much higher temperatures now shows such promise that it may supplant fission as a source of industrial heat energy, but the amount of development necessary is almost frightening, especially when one thinks of the comparatively crude character of the plant used for carbonising or gasification of coal. It has been said recently, however, that fusion will not replace fission for the production of power unless, or until, it can show monetary costs.

Not the Most Effective

It looks, therefore, that the atomic age we have visualised will start with a promise of a high level of production of electrical energy. This indeed begs the question of efficient utilisation. For general power purposes its effectiveness cannot be disputed, but for industrial work it is not the most effective in more than a proportion of cases. It would be unfortunate if the level of process efficiency in the country were to fall for no other reason than that services were so directed that electrical energy had to be used without option. Some move in this direction is probably inevitable since atomic energy can be utilised as yet only through an electrical channel, but something must be done to prevent the trend from going too far, until the time comes when thermal energy of atomic origin is available.

In the latter context the gas industry will have to play an important part if it is to survive to carry a higher load than at present. Mere suitability for certain markets will not be enough in the new age, much will have to be done to reduce

* Throughout the paper all quantities are given in equivalent tons of coal, unless so stated, taking one ton of coal as equal to 1 ton of coke, 0·9 ton of breeze, 0.6 ton of oil, 40,000 cu.ft. of coke-oven gas, and 2,420 kW of electricity.

costs and increase availability if the industry is not to be held to its present output. The effect of such limitation could be disastrous in preventing technical progress and defeating new ideas.

Perhaps the best way to consider the future of the industry is to review the present position, and the trends which are already indicated. The annual amounts of raw material used for gas production at present are:—

Coal	*Coke*	*Oil*	*Coke-oven gas*	*Refinery gas*	*Natural gases*
million tons p.a.			millions of therms p.a.		
27.7	1.3	0.5	457	starting	7

From these the amounts of products sold are ——, × 10^6:—

Town gas,	Coke,	Breeze,	Coal-tar fuels,	Benzole fuels,
therms.	tons.	tons.	tons.	gal.
2,589	12.6	2.8	0.9	52

In these the main items in the national energy programme are the gas and coke; the others, important as they may be in their spheres, may be left out of consideration here.

During the past few years the sales of gas and coke have become regrettably static. There can be no question about the truth of this, or that the sale of electricity and oil in the same period has increased markedly at the rate of some 6% and 8% per annum respectively. It is most pertinent to ask why this should be so despite the fillip which the Clean Air Act should have given to gas and coke, and the only answer which emerges is that gas is too expensive, coke quality is too unsatisfactory for the domestic consumer, and oil is becoming preferred to gas in the industrial market. For a period of years the industrial market for gas did increase steadily, but an examination of the records shows that this was not due to an influx of new customers. Indeed, from 1954 to 1956, when domestic and commercial customers for gas each increased in number by 1½% each year, the number of industrial customers decreased by 3%. It is something that commercial sales are increasing (5% p.a.), but the failure to retain industrial customers, to say nothing of finding new ones, shows a dismal state of affairs. The figures are:—

	Domestic	Commercial			
		Industrial		Public	Total
1954 Consumers	11.9	0.103	0.602	—	12.6
1956 × 10^6	12.2	0.100	0.620	—	12.8
1954 Therms of	1,360	704	364	99	2,257
1956 gas × 10^6	1,347	759	399	80	2,589

This is not reassuring and, if the industry is to do more than merely maintain its present position, it simply must reduce the present price of gas. How this is to be done is complicated by the coke situation and the balance of price between coke and gas, but where the effort might most profitably be made is probably indicated by the proportion of present-day costs. These are: Manufacture 67%, distribution 13%, consumer services 9%, and administration, etc., 11%. The high incidence of the first suggests that methods of production should form the most-rewarding target but this may not necessarily be so; the best target may depend more upon the scope available for cost reduction.

Trends in the development of carbonising plant over the years are familiar to all of us, and it is well known that modern plant is characterised by a high efficiency of operation on which little advance, if any, is to be expected.

Coal Consumption Will Decrease

Mounting costs of good gas coal, N.C.B. charges which are weighted, perhaps unfairly, against the carbonising industries, and economic conditions generally have brought about a strong trend towards the replacement of gas coal by other raw materials, and particularly by oil products. This might not have happened, except in the case of refinery gas, if more enterprise had been shown in the development of the process for the high-pressure gasification of weakly-caking coal; this is regrettably still in the early development stage, although the contract for a first 5 mill. unit has now been signed, and cannot retard the present moves in the direction of oil products.

If we assume now, as it seems we must, that the gas industry will remain static in output for some years from now, its consumption of coal must decrease. The several causes of this decrease include the increasing purchase of coke-oven gas, the use of natural and coal-measure gas where this is available, but particularly the above significant trend towards oil products, including waste refinery gas, oil-gas processes, and the importation of liquid methane.

Between 1948 and 1956 the amount of coke-oven gas purchased increased from 60 to 88 × 10^9 cu. ft. a year, and now represents about 28% of the gas sold, an amount which would have taken 5.8 mill. tons of coal to produce by a carbonisation process. The amount, large as it is, is still little more than a quarter of the gas which the coke-oven industry produces, and considerably more could be purchased. The coke industry must, of course, have a proportion of its own gas for its own uses and for those of its associated industries, particularly steel. The proportion of this demand at present is about 36%, but it is increasingly steady. Of the remainder, 38% is used for oven heating and, if the use of producer gas for this purpose could be extended, most of it could be made available to the gas industry in due course. At present only one-fifth of the oven-heating load is taken by producer gas, and blast-furnace gas, but there is no obvious reason why expansion should not take place, particularly if produced from small weakly-caking coal.

Potential Saving An Incentive

In some areas the gas industry is already taking a high proportion of the coke-oven gas available but in others it is not (South Wales 70%, North Western only 2%), so that there is still a long way to go. The present total of oven gas used for heating is 130 × 10^9 cu.ft. a year; it is calculable that, if all of this were to be transferred to the gas industry, it could replace 9 mill. tons of carbonisation coal. How far it might be possible to proceed towards this objective will depend upon the practical factor of gas distribution and gas grids, and upon the economic factor of the continuance of a reasonable differential between gas industry production costs and purchase price. The present ratio of gas to holder is 25/48 pence per 1,000 cu.ft. The economic balance does seem to be in favour of the transfer, while the potential saving of caking coals is an additional incentive.

A second method of obtaining gas without recourse to coal gasification is the collection of natural gas, and methane from coal measures. Scotland has been a pioneer in the former, and Wales in the latter has successfully launched a scheme which, it is predicted, will yield 10 mill. therms a year within a few years' time. In this field the amounts which it will be possible to obtain must be small, but increase from the present level is possible and should be attempted wherever possible, on the understanding that every million therms a year means the saving of 13,000 tons of gas coal.

It would seem possible that the gas boards have now acquired more faith in the petroleum companies than in the Coal Board as a future source of raw material at a reasonable price. The result of this has been a positive move of some magnitude in the direction of oil products and a prospective reduction in the production of coke. The question at issue is whether the economics of the move are such that the loss of coke can be replaced by gas sold at a lower price than at present.

It is clear that the first step must be the utilisation of the waste refinery gas, which is of the order of 350 mill. therms a year, or 13% of present gas sales. It was unthinkable that such a loss should continue; if all of it could be reformed for gas-industry usage some 4½ mill. tons of carbonisation coal could be saved. It is now satisfactory that the first large venture in this field will start soon with the Romford plant, of 65 mill. therms a year, and that others will not be long in following at Isle of Grain (Kent), Fawley (Hants) and Grangemouth (Scotland).

The reforming of refinery gas is linked with the advances in oil gasification to the extent that the same plant can be used for either purpose. Plants are now being installed at an increasing rate and it is understood, on good authority, that the present total of plant installed and under construction has a potential output of 190 mill. therms a year, or about 12% of present gas sales. If one adds to this the 12% of contribution now made by carburetted water gas the growing dependence of the industry on oil products becomes very apparent.

Another factor in the march of oil products, which may well rise to considerable proportions, is the proposed importation of liquid methane from the oil fields. The pending first experiment of the Gas Council with the North Thames Gas Board with a first tanker and a reception point in the Thames

estuary should supply the evidence on which further planning can be based.

Theoretically there is no reason why tankers could not supply reforming plants at any or all of our suitable ports. Efficient reforming processes are already available, and the prime considerations which must decide the position are: (a) The cost at which town gas can be achieved; (b) the proportion of gas productivity which could be attempted; and (c) the national security of the proposals.

The first of these can, no doubt, be answered by the results of the first experiment, and within the short period of a few years, but the others will require careful thought and calculation.

It does seem that the project will have an important bearing on the future of the industry in the period before 1975. The arguments in its favour are a cheaper gas, and one free from organic sulphur. The arguments against are whether the capital cost of ships, tanks and reforming plant is indeed less than that associated with carbonisation or gasification plant, whether commercial security can be safeguarded by long-term contracts, and whether trading in the dollar area can be avoided by the obtaining of supplies in a sterling area such as the Middle East. It has been stated in the House that Government permission for the expenditure of £1.1 mill. on the initial experiment was granted on the assumption that the final gas would indeed be cheaper than gas made from coal but the evidence is as yet incomplete. Preliminary calculations have, however, been made in the United States which arrive at a promising result. It is true that the calculations are made on the very-large scale of 40 mill. therms per day but this may well be a practical proposition at the point of production of the well gas.

On this scale the capital investment is 240 mill. dollars and it is taken that the gas will be available at source at from 0.4 to 2.5 cents per therm. At these two levels the delivered cost at New York, 1,900 miles from the Gulf of Mexico, is calculated to be 2.5 to 4.6 cents, and an economic sale price is stated to be 6 cents, which is the present price of pipeline natural gas delivered at New York. The distance to Britain from the Gulf is not very different from this—2,500 miles—and the delivered cost there is calculable to 3 to 5 cents. If Britain were to buy its supplies in the dollar area the delivered cost in pence is calculable at the current rate of exchange and is 2.6 to 4.3 pence per therm. This is, indeed, favourable enough although it may not have included reforming costs.

Transport from the more remote oil fields of the Middle East, which means about 6,500 miles by the shortest route through the Suez Canal, would cost considerably more since sea transport is proportional to mileage; an approximate delivered cost is about 4.5 to 6.5 cents per therm, but the figure is less reliable than the first calculations from the Gulf.

It is evident that the pressure gasification of coal cannot come to the rescue against this strong move towards oil products since the first plant has yet to be built and its economics evaluated. Actually the contract for the first plant of 5 mill. cu.ft. per day was not placed until the end of last February. The North Western Board has been given the privilege of operating this first plant, and it is much to be hoped that their findings will be favourable in order that the process may provide a strong balancing factor against the uncontrolled use of imported raw materials.

The above considerations show clearly that present planning is engineering a move in the direction of producing the town gas required in the immediate future by means which must reduce the amount of caking coal required by the gas industry, and also the amount of coke available for sale. This will prove to be an economic proposition only if the sale price of the gas can be reduced to a level such that it can compete successfully in both domestic and industrial markets against oil and electricity. Also, the loss of coke could have serious repercussions upon the formation of smokeless zones unless this is prevented or reduced by re-introducing coal-fired gas producers for the firing of retorts.

The move towards more oil as raw material, and more gas as product, must have an important bearing upon the chances which the industry will have in establishing a position of progress before the atomic age is really established at our estimated year of 1975. It does seem most important that the possibilities of coal gasification should be examined at the earliest possible date by pushing ahead with the North Western experimental plant at the utmost speed. The delay in this work does seem to be the weakest link in the chain of re-establishment. The development of this process also entails a move away from coke to gas and, in that respect, does not affect the underlying policy. If such policy is indeed that of the Gas Council today it might be more than helpful if it were published as a declared policy, but perhaps it may be necessary to wait for this until trend in gas costs is better established.

It has been suggested that the process heat required for the carbonisation or gasification of coal could be supplied by nuclear energy. It is true that this would save the expenditure of the coal now used for this purpose, but, after all, most of the process heat now used is obtained from waste-heat sources and it is only that used for heating retorts which could form this target. This now amounts to about 10% of the thermal value of the coal carbonised and is required at a temperature of about 1,200°C.; it is a matter of some doubt as to whether this amount is large enough to justify the application of so complex a science as that of nuclear energy.

United States Research

It would be unwise, however, to prejudge the position, and much interest must attach to the exploration work of the U.S. Bureau of Mines in association with the U.S. Atomic Energy Commission and elsewhere. The group is making progress in a search for materials of construction of a reactor which would withstand the conditions of severe thermal shock while completely preventing the escape of dangerous fission products either to atmosphere or into the products. The Bureau is more interested in gasification than in carbonisation and it is possible that the former might contain an easier problem in that a system can be envisaged in which the gasification of pulverised coal could be achieved by hot gas circulated through the nuclear reactor.

If suitable materials can be found, no doubt the next step will be the construction of an experimental unit. Up to the present the research has indicated the possible suitability of certain metal carbides, and silicides. Otherwise the project would seem to have a long way to go. In view, however, of the leading position of Britain in the field of the utilisation of atomic energy, it does seem that there should be a liaison between the Gas Council and the U.S. Bureau of Mines, or even parallel development work in this country.

Electrical Precipitators

AN illustrated publication concerning electrical precipitation recently produced by W. C. Holmes & Co., Ltd., will be of interest throughout the gas industry. The Company's gas cleaning division was inaugurated more than 20 years ago in association with Elex A.G. of Zurich. In subsequent years this association has extended to include Koppers Company, Baltimore, U.S.A.; Apparatebau Rothemuhle, Germany; and several other companies in all parts of the world. Thus technical data gained from practical experience is available to the Company not only from their own activities in the United Kingdom and the Dominions, but also from many other countries, enabling them to develop a wide range of plant.

More Help for the Foreman

ON the shop floor the foreman's mistakes may cost time and money. They may cause loss of prestige. To meet the modern foreman's need for an away-from-work opportunity to practise what has been preached at him at the many human relations courses available to him, the Industrial Welfare Society has designed a one-week course with the minimum of lecturing and concentration on practical exercises in speaking, interviewing, group discussion leading, report writing, and study in groups. Delegates will act out problems and interview situations, have their verbal reports tape-recorded and analysed, and be introduced to the uses of visual aids in the presentation of ideas.

The D.K.H. 'Controlled Flow' Coke Oven

Continued from p. 83

The D.K.H. oven system claims to be able to overcome these difficulties by certain modifications to the regenerator design. First, the regenerator sole flue is divided longitudinally into two flues of equal capacity. One half is connected to the air or lean gas inlet and the other half is connected by the main waste gas flue to the chimney. Secondly, the regenerator itself is divided into a number of vertical 'cells' from each of which one or several heating flues in the main wall may be fed.

Thirdly the regenerator sole flue is further subdivided so that each of these vertical cells is connected to the air box by individual flues or ducts, one for the admission of air or lean gas and the other for the drawing off of waste gases. In this way the flow of gases in either direction can be effectively controlled from outside the oven heating system itself. The longitudinal division of the regenerator sole flue makes it possible for the two independent rôles expected of the heating system to be carried out as efficiently as possible, but great care in the design is necessary to avoid short circuiting in the sole flues.

These modifications are shown diagrammatically in Fig. 4, which represents a cross section of both regenerators for any given oven, and Fig. 5, which shows a cross section at the point where the air box is connected to the regenerator sole flue and the way in which the regenerator 'cells" are each individually connected through its ducts to the back of the air box.

Adjustment to the flow through the regenerator 'cell' ducts at the back of the air boxes is made by altering the effective cross sectional area by putting in a suitable number of flat tiles, as shown in Fig. 5. Such adjustments are easily and quickly carried out so that little time is lost when changes of carbonisation time or alteration from rich gas to lean gas firing must be made. Tests carried out on a battery of coke ovens which incorporate this heating system, show that the pressure losses are low.

This system would seem to have advantages over other systems in being able to achieve uniform heating throughout the length of the wall. This is especially true at the extreme ends and on the coke side where influence of the taper increases the coal capacity of the oven. The loss of heat at the extreme ends of an oven wall is always increased by taking off the oven doors for pushing and the heat losses from the door iself. To overcome this, extra gas needs to be burned in the flues at either end of the oven. In most systems this is difficult to carry out effectively, especially where lean gas is being used for underfiring, but it will be noticed in Fig. 4 that both the No. 1 flues on the machine side and the coke side have an individual 'cell,' so that their air needs as well as their gas needs may be individually adjusted.

The extra quantities of gas and air needed on the coke side of the battery can be supplied in the normal way by increasing the gas feed pressure slightly on that side and by opening the air inlets to suit, but this system promises more exact adjustment to allow full advantage to be taken of better combustion of the burning gas and its better distribution along the heating wall. It would seem that this system includes most of the advantages claimed for the twin flue systems in which the gas is burned in alternate flues with the adjacent flue carrying away the waste gases. To overcome irregularities in the vertical heating of the oven wall, the D.K.H. oven relies on a special design of shaped brick.

In other systems, efforts have been made to lengthen the rich gas flame by mixing it with a proportion of flue gas by a circulation flue, or by admitting the air for combustion in stages up the wall. This it would seem is admirable for a coke oven battery burning rich gas only, but for a compound oven which is also to burn lean gas, the lengthening of the long lean gas flame is something of a disadvantage. In the D.K.H. system, which must be equally efficient whatever type of fuel gas is used for underfiring, such methods of flame lengthening are not used, but instead a patent 'hump-header' is used.

At a point about three-quarters of the way up the oven wall this type of header is built into the heating flues for four courses. Its shape is such that the outer surface area increases successively over the four courses and it is able to absorb more heat by radiation from the rich gas flame than from the much longer lean gas flame. The radiant heat absorbed balances that lost to the upper part of the wall in other systems, where no special means is used for lengthening the flame, and at the same time overcomes the difficulties in trying to burn lean gas in a flue designed to burn rich gas most efficiently. The effectiveness of this arrangement becomes apparent when the vertical temperature difference from bottom to top of the oven wall is compared for either means of underfiring.

The D.K.H. 'controlled flow' system of coke oven heating may be applied equally well to batteries of compound ovens where the 'gas-gun' method of feeding the rich gas or the 'underjet' system is being employed.

British Standard Version of Ringelmann Chart

WHILE all British Standards are produced with care, in the case of B.S. 2742C, 'Ringelmann Chart,' even more care than usual has been taken to ensure a high degree of accuracy. This new publication is the British Standard version of the chart by means of which a visual assessment can be made of smoke emission from industrial chimneys. This method, first devised by Professor Ringelmann in Paris at the end of the last century, has been made the basis of assessing conformity with legislation under the Clean Air Act which becomes fully effective on June 1. The chart published by B.S.I. will provide a standard yardstick for use in connection with the new legislation.

The Act forbids pollution of the air by 'dark smoke,' the definition of which is smoke as dark as or darker than Shade 2 on the Ringelmann chart. The chart, printed on white board, consists of five 10 cm. squares ranging from No. 0, which is left white to indicate 'no smoke,' to No. 4 which is criss-crossed with thick, black lines to simulate black smoke. A black strip above the No. 4 square assists quality control during printing of the chart.

In practice the density of smoke emitted by a chimney is estimated by comparing the smoke with a Ringelmann chart held at such a distance from the observer that the black lines on the chart seem to merge into the white background producing, for each shade, an apparently uniform shade of grey. In producing the new British Standard chart a board has been chosen which will not be affected by water vapour in the atmosphere. Special care has been taken in the printing to achieve a high degree of accuracy. In addition to B.S. 2742C a separate publication, 'Notes on the Use of the Ringelmann Chart' (B.S. 2742) has been issued which users of the charts will find it useful to have for reference.

In this connection, attention may be drawn to three published British Standards which are now being followed in the manufacture and use of smoke alarms and indicators. They are B.S. 2740, 'Simple Smoke Alarms and Alarm Metering devices'; B.S. 2811, 'Smoke Density Indicators and Recorders'; and B.S. 2741, 'Simple Smoke Viewers.' In the case of the first two, equipment is now being made which carries B.S.I.'s 'Kite' certification mark.

Copies of these publications may be obtained from the British Standards Institution, 2, Park Street, London, W.1. B.S. 2742, price 2s. 6d.; B.S. 2742C, price 3s. (by post 5s.). Packet of 10 copies, 30s.